THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF NATURAL RESOURCES AND TOURISM

WILDLIFE DIVISION

Sustainable Wetlands Management Program

Tanzania National Single Species Action Plan 2010-2020 for the Conservation of the Lesser Flamingo (Phoeniconaias minor)

(Photo courtesy Matt Aeberhard)

February 2010

For the establishment of Community Based Natural Resource Management of Wetlands

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Subsequent Reviews:

This first attempt is a rolling, 10-year National Single Species Action Plan (SSAP). It shall give rise to the first 5 year Integrated Management Plan (IMP) of Lake Natron, a critical, key Ramsar site for the survival of the East Africa Lesser Flamingo sub-population. It will guide the incorporation of appropriate actions in the three-year, District Development Plans (DDP) of associated districts and the associated 5-10 years Wildlife Management Area (WMA) General Management Plans (GMP). As such, rolling reviews and updates shall take place every 3-5 years so as to align appropriate actions based on results on the ground. The NWWG AEWA Sub-committee shall be the oversight body, advising the NWWG and NAWESCO, monitoring progress. An emergency review will be undertaken if needed.

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Foreword

The Government, when revising the Wildlife Policy (2007), saw it proper to place equal emphasis on wildlife, as on wetlands. Wetlands had to-date been considered wastelands, unsustainably managed, taken for granted, undervalued! To-day, we realize that although wetlands make up less than 10% of land area, nevertheless their "critical, life support services" are the most important to sustain our lives, our wildlife, our food and water, our economy, our hydro-energy, and our rural livelihoods. National actions, such as the Single Species Action Plans are therefore key to the sustainable management of our resources and their biodiversity, so as to sustain ecosystem functions.

Lake Natron Ramsar Site:

In 2001, the Government, declared Lake Natron a Ramsar Site, in appreciation of its international significance as one of only 5 known world-wide natural breeding sites, home to 75% of the global population of Lesser Flamingo. Whereas in the 60's, Protected Areas could be set aside with minimal conflict, government in 2007, cognizant of the growing population, made an important policy statement, *"that to sustain wildlife and wetlands, wise use and management will depend on how the public perceive the importance of conservation now, and for future generation's"*. Science and technological advancement, coupled with training and understanding is therefore key to any action plan! Broad based knowledge of life support values, of economics and of livelihood opportunities from ecosystem services can change attitudes to current, unsustainable resource use. Awareness of best practices for wise use, changes perceptions and values and empowers appropriate actions. Importantly, users need information and science base knowledge is needed to influence decision making and planning of future, sustainable resource use! This Action Plan for Lesser Flamingo, its associated complex of soda lakes, feeding and breeding, is based on the principles of "wise use".

Users of This Action Plan:

For sustainable wetland management, the Wildlife Policy calls for greater cooperation between Wildlife Division, TAWIRI, TANAPA, other sectors, academia, NGO, private sector, local government and Protected Area Managers. This Action Plan therefore is the responsibility of all managers and users, alike, to ensure implementation through national and local development plans. To ensure user application, in areas where Lesser Flamingo are to be found, this calls for development and BirdLife partners, outreach programs, Wildlife Clubs, Extension Services, Community Based Conservation (CBC), Community Conservation Services (CCS), Schools, Community Based Natural Resource Management (CBNRM) projects, Malihai Clubs, WCST, district officers and schools, to work with Central Government and Protected Area Management to mainstream actions.

Focal Action Areas:

Lesser Flamingo sites, especially Lake Natron, provides local livelihoods with poverty reduction services, like: pastoralism, irrigation, food production, water, bush meat as food, fuelwood, etc, but also has economic potential for eco-tourism, hydro-electric power, commercial irrigation and mining. Coupled with the consequences of global climate change, this Action Plan calls for more "environment friendly uses", to ensure appropriate mitigating actions and wise use through best practice, notably: "wetland friendly investments" (WFI).

This Ministry is grateful to Danida for financial and technical support. We wish to thank the participating international partners (Flamingo Land and BirdLife International) and local organizations, especially the AEWA Sub-Committee, the NWWG and the staff of the Wetlands Unit, who made this publication possible. It is now up to every government sector, local government, user groups, NGO, investors and development partners, to ensure these undertakings are mainstreaming in local actions, and in wetland friendly investments to support sustainable ecosystem services in the areas where Lesser Flamingo are to be found.

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Ms Maimuna K. Tarishi,
Permanent Secretary.

List of Acronyms

AA	Authorised Association
AEWA	African-Eurasian Migratory Water Birds Agreement
AWF	Africa Wildlife Foundation
CBC	Community Based Conservation
CBD	Conservation of Biological Biodiversity (Convention)
CBO	Community Based Organisation
CBNRM	Community Based Natural Resource Management
CCS	Community Conservation Services
CEPA	Communication Education and Public Awareness
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CMS	Convention on the Conservation of Migratory Species
DC	District Council
DCA	Directorate Civil Aviation
DDP	District Development Plan
DeNRM	Decentralized Natural Resource Management
DW	Director Wildlife
EAP	Environmental Action Plan
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
ENSDA	Ewaso-Njiro South Development Authority (Kenya)
FD	Fisheries Department
FZS	Frankfurt Zoological Society.
GCA	Game Control Area
GEF	Global Environment Facility.
GMP	General Management Plan
IBA	Important Bird Area
IMP	Integrated Management Plan
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resource Management
KFS	Kenya Forestry Service
KWS	Kenya Wildlife Service
LF	Lesser Flamingo
LUP	Land Use Plans
MCT	Malihai Clubs of Tanzania
MNRT	Ministry of Natural Resources and Tourism
NAWESCO	National Wetlands Steering Committee
NWWG	National Wetlands Workings Group
NBSAP	National Biodiversity Strategic Action Plan
NEAP	National Environmental Action Plan
NEMC	National Environmental Management Council
NP	National Park
PA	Protected Area
PM	Project Manager
RAMSAR	Convention on Wetlands of International Importance
RSPB	Royal Society for the Protection of Birds
SEA	Strategic Environmental Assessment
SOER	State of Environment Report
SSAP	Single Species Action Plan
SUA	Sokoine University of Agriculture

SWMP	Sustainable Wetlands Management Program
TAFIRI	Tanzania Fisheries Research institute
TAWIRI	Tanzania Wildlife Research Institute
TBAP	Tanzania Bird Atlas Project
UDSM	University of Dar es Salaam
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
VDP	Village Development Plan
VPO-DOE	Vice Presidents Office- Director of Environment
WCS	Wildlife Conservation Society (New York)
WCST	Wildlife Conservation Society of Tanzania
WD	Wildlife Division
WFI	Wetlands Friendly Investment
WMA	Wildlife Management Areas
WU	Wetlands Unit
WWF	World Wide Fund for Nature

Executive Summary

The Lesser Flamingo (*Phoeniconaias minor*) (LF), the smallest flamingo species in size, but the most numerous in number, is an ornithological spectacle of high and diverse ecological and economic value in East Africa. It is a major global, charismatic tourist attraction, and an iconic symbol of conservation, popular in tourism and in zoos. Despite its numbers, this bird is currently categorised as globally "Near Threatened", listed in the 2009 IUCN Red List of Threatened Species. Population declines over the past 30 years of 20-40% are estimated, and some major recent, mass die outs in the order of 100 - 200 thousand birds, suggest that this species may be considered to qualify for a "threatened category" in the near future. Its vulnerability is highlighted by the fact that there are **only five known**, natural, regular breeding sites in the world, and that 75-80% of the global population, the whole of the East Africa stock (EA), depends entirely on Lake Natron for its breeding success and survival. This Action Plan takes into account that all the EA LF breed at Lake Natron, and no-where else!

This regional sub-population is shared by Tanzania, Kenya, Uganda and Ethiopia and ranges between 1.5-2.5 million, of an estimated global population of 2-3 million (Wetlands International, 2006). The bird's natural habitats, particularly within the East Africa Rift Valley face threats of different magnitudes. Without concerted and carefully focused conservation actions, the Lesser Flamingo risks joining the IUCN Red List of "Vulnerable" category of species. This Action Plan, therefore is cognizant that the East African sub-population share the same common regional sub-population pool. That the Lesser Flamingo is largely confined to nine of the major Rift Valley soda lakes, and therefore each country has a trans-boundary responsibility to jointly manage the current, shared population. The Action Plan is cognisant that a mishap in one country could have dire consequences for the others! Joint action is called for.

Natural resource managers face a major challenge, not least is the global concern about climate change and the wholesale losses and degradation of natural habitats due to excessive human pressure on ecosystem services. This Action Plan outlines how little is known of the bird, of its biology and ecology, of its key habitats and, of the threats it faces, and how to manage them. Most important of all, near nothing is known of its breeding, and the significance of Lake Natron. Clearly there is a need for research, to enhance knowledge and understanding of the bird, its biology, its habitats, of human pressures, and of its economic importance. This scientific knowledge can become the basis for informed decision making, leading to "wise use", and remedial action through local sustainable management strategies. The aim is a "win-win" situation. Targeted is to reduce human pressures on those shared ecosystem services, so as to ensure both sustainable livelihoods and bio-diversity survival. A key strategy in this Action Plan is to add value through tourism to avoid long term resource use conflict, achievable through establishing Wildlife Management Areas (WMA) in key sites.

To be in synchrony with trans-boundary initiatives by neighbouring countries and in line with global actions, the Tanzania LF Single Species Action Plan (SSAP) has been aligned with the "2008 Kenya National Lesser Flamingo Action Plan". It is also harmonised with the "2006 International Lesser Flamingo Species Action Plan", and follows the AEWA 2005 recommended "SSAP Guidelines". Emphasised are the probable conflicts with anthropogenic activities in the catchments, with agro-industrial, mining, tourism, economic and livelihood developments. Causes of frequent Lesser Flamingo mortality in Kenya and Tanzania appear related. Linked to cyanobacteria toxins and infectious diseases, pollution from heavy metals and pesticides, food stress brought about due to lake level fluctuations or sedimentation (the latter due to overgrazing, agriculture conversion or deforestation in the catchments) or due to drought, a long term feature of the fragile, desert like, Rift Valley environment. The Action Plan takes into account these stresses are likely to intensify due to global climatic change.

The Government of Tanzania is committed to nature conservation, and to discharge its responsibility in line with the precautionary and wise use principles of the Ramsar Convention which it signed in 2001. Central government policy, legal and technical support frameworks aim at supporting local governments and local communities, to include and implement sustainable management through their Village and District Development Plans (DDP). One focus of the Action Plan is to form appropriate institutional arrangements, especially Community Based Natural Resource Management (CBNRM) (eg. WMAs) implementable through decentralization, or Decentralized Natural Resource Management (DeNRM).

To implement this SSAP, Tanzania looks to work closely with all stakeholders, notably: the Lesser Flamingo

range states in East Africa (and Southern Africa), the Flamingo Specialist Group of the IUCN Species Survival Commission and Wetlands International, the World Wide Fund for Nature (WWF), Wetlands International, BirdLife International, Convention on the Conservation of Biological Diversity (CBD), Ramsar Convention on Wetlands, Convention on the Conservation of Migratory Species (CMS), and African-Eurasian Waterbird Agreement (AEWA), and Royal Society for Protection of Birds (RSPB), amongst others. The Action Plan vision is to participate actively in the proposed International Lesser Flamingo Working Group (under the AEWA Framework).

A decentralised approach to CBNRM, leading to Integrated Water Resource Management (IWRM) is being deployed as the key strategy to address the challenges that the Lesser Flamingo face. This includes establishment of new Ramsar sites (eg Lake Manyara), mainstreaming this SSAP in local government District Development Plans (DDP), implementing this SSAP through the Integrated Management Plans (IMP) of key wetlands sites (like Lake Natron) and of inclusion in the General Management Plans (GMP) of key protected area (like Manyara NP, Ngorongoro Conservation Area, Arusha NP, etc) and creation of WMAs or wetland reserves in key sites. The call for local action in communities that live with the Lesser Flamingo, will be through adoption of this SSAP in village land-use planning (LUP). The Action Plan notes LUP and WMA processes are key to CBNRM, to protect the environment, regulate and manage the use of natural resources and livelihoods, to instil harmony, to ensure sustainability of ecosystem functions.

Noting a lack of scientific based information for informed decision making, research and key site monitoring will be given priority. The aim is to build a sound scientific knowledge base on the flamingos, their environment, and of human threats on shared ecosystem services, to make these sustainable and secure for bio-diversity and local livelihoods. Special attention will be to water resource conservation, restoration of environmental flows or catchment degraded sites within the watersheds, designation and protection of the lakes for improved conservation status, enforcement of environmental standards together with compliance with EIA and environmental audit procedures. The Action Plan advocates sustainable agricultural practices and utilisation of natural resources by industry and catchment communities will be promoted through training, Communication Education and Public Awareness (CEPA), especially through Wildlife Clubs (ie. MCT and WCST) and by Wetland Friendly Investments (WFI) and micro-project programmes.

This Action Plan implementation framework is the Environment Management Act (EMA) and Wildlife Policy and Act. It will contribute to increased awareness on the mandatory need for a State of the Environment Report (SOER) of wetlands, and associated Lesser Flamingo populations. Hopefully, this approach shall inspire further research and monitoring to fill the knowledge gaps, and implementation shall be mainstreamed in the Environmental Action Plans (EAP) of District Development Plans (DDP). The Government is acutely aware that it lacks resources, human and financial to implement this plan. Therefore, to spread the load, the Wildlife Division, as the Ramsar authorised representative, shall stimulate effective and coordinated mitigation of threats and management actions by all stakeholders. The Action Plan envisages partnership actions by central government, local government, local communities, private sector, research and higher education organizations, non-governmental organizations (NGO), CEPA agents, as well as with those, who share the trans-boundary responsibility, and international development partners.

In Kenya, the current tourism value of the species has far greater significance than in Tanzania, but hopefully, with the publicity following the 2009 release of the Disneynature feature film, *"Crimson Wing"*, this has potential to change. It is important therefore that the region rally in harmony to emphasise the importance of working together, in synergy, of the potential of benefiting from local, national and trans-boundary action. Protection of the shared catchments of the various wetlands inhabited by this species, is important. Likewise, all partner countries must instil the same harmony in policy, legislation and wise use practices for catchment industry, agro-industry, local development and community livelihoods. A sense of regional cooperation in sustainable management is needed! Joint protection actions are called for due to the nomadic or itinerant (ie trans-boundary migratory) nature of this species. It is therefore important that the Action Plan encourages all countries with the shared population to consider including all key sites and habitats in their SSAP, to maintain the same level of standards.

A number of common biodiversity conservation projects, protected area strategies, local government, NGO actions and private sector initiatives are underway in the Rift Valley in Kenya and Tanzania. All these efforts relate to the economic benefits of local people and the conservation of the Lesser Flamingo, and therefore need

to be integrated, synchronised and harmonized locally and with trans-boundary actions. The Action Plan notes to synchronise action and coordinate efforts, a Regional Network is needed.

The most critical threats to the survival of the Lesser Flamingo in Tanzania are thought to be the loss and/or the degradation of its specialised habitats. Habitat degradation results from alteration in hydrology and hydro-chemistry, affected by changes in rainfall, water flow and water quality due to over-abstraction for irrigation, or catchment conversion to agriculture, or damage due to deforestation (for timber or fuel or due to wild fires) or erosion due to overgrazing by pastoralists, or poor land use management practices, and fires or climate change. Threats of high importance in some feeding lakes (mostly in Kenya, but also suspected of Lake Manyara), include poisoning (particularly by cyanobacteria toxins and pesticides) and infectious diseases (mycobacteriosis and avian cholera). Threats of lower regional, but significant local importance include at Lake Natron the proposed local extraction of soda salt (ash). Current use by the Maasai community as a small scale salt industry has no effect on the flamingos, and could be considered to be a sustainable/positive use of the lake providing local income and employment. But over-riding these are the potential, but currently in abeyance, threats to Lake Natron of proposed, large scale investments in water extraction for hydro-power or salt plants (Kenya), large scale irrigation (Tanzania and Kenya) and the prospect of industrial soda ash mining in Lake Natron. These threats are ranked in this Action Plan for action.

This 10-year plan envisions joint action, ensuring 'a stable, viable and healthy East Africa population of the Lesser Flamingo'. It aims at local and trans-boundary cooperation in stabilising the population size and distribution of the Lesser Flamingo in the region within the next ten to fifteen years.

The main objective of the Tanzania SSAP is: "The adoption of the International SSAP objectives (Section 3.1.3), domesticated to Tanzania conditions".

The expected outputs from the Tz LF SSAP, are

1. All key breeding and feeding sites are maintained in good ecological condition.
2. Breeding colonies are not disturbed.
3. The effects of poisoning and/or diseases, reduced.
4. Harvesting and trade in live specimens has no effect on the Lesser Flamingo populations.
5. Minimised collisions with manmade structures.
6. Minimised human disturbance at non-breeding sites.
7. Scientific knowledge gaps filled.
8. Institutional and administration arrangements for implementation of the LF SSAP, in place.

The focus of the Tanzania LF SSAP will be on the following key sites, defined as meeting Ramsar criteria of 1% of bio-geographical population (ie + 20,000 birds), listed in 2 categories, in order of priority for the Lesser Flamingo:

Unprotected key sites, and therefore priority for management, and associated district government:

1. Lake Natron - (Protected by 2 GCAs and 2 WMAs, u/way) Ngorongoro & Longido DC, and Ramsar PM.
2. Lake Manyara - (only 50% protected by Manyara NP) Babati DC.
3. Lake Eyasi - Ngorongoro, Meatu and Karatu DC**.**
4. Lake Burungi - (67% protected inside WMA) Babati DC.
5. Lake Kitangiri - Meatu and Iramba DC.
6. Singida Lakes - Singida DC.
7. Lake Balangida Lelu - Hanang DC.
8. Bahi Swamp - Dodoma Rural and Manyoni DC.
9. Lake Rukwa - (Part protected Rukwa-Lukwati GR) Mpanda, Chunya, Mbozi & Sumbawanga DC.

Key sites, but protected and therefore not of immediate priority, as already under some form of protected management:

10. Momella Lakes - (67% protected by Arusha NP).
11. Lake Empakai - (100% protected by NCA).

12. Lake Magadi (100% protected by NCA Crater lake).
13. Lake Ndutu (100% protected by Serengeti NP).

In summary, the key strategic initiatives to achieve the objectives of the Action Plan are to:

1. **Local Government Action:** Mainstreaming action in decentralised policy & legislation, through local government development plans (DDPs and VDPs).
2. **Key Site Actions:** Through key site IMP/GMP, instil species & habitat conservation and wise use.
3. **Key Site Monitoring:** Through monitoring keep a record of population trends, catchment and site conditions.
4. **Informed Decision Making:** Through research, provide knowledge on linkages between biology and catchment condition for informed decision making on policy and development planning.
5. **Awareness Raising:** Increase communication, education and public awareness (CEPA) around key sites, advocating for "wise use" where unsustainable practices threaten ecosystem services.
6. **Training:** Provide training to management institutions (like local government, NGO and CBO), and
7. **Community Based Natural Resource Management:** Enhance community involvement, adding value and benefit sharing through Wildlife Management Areas (WMA).
8. **Mobilise Resources:** All stakeholders, central and local government, civil society and private sector have a role to play to pool resources to support sustainable use of these key ecosystems for the long term benefit of mankind.

This action plan is seen as a rolling plan, to be re-visited as more information becomes available, to be updated should an emergency arise.

Contents

List of Figures

List of Tables

TANZANIA LESSER FLAMINGO NATIONAL SINGLE SPECIES ACTION PLAN: 2010-2020.

1.0. INTRODUCTION

1.1. Background to This Action Plan

The need for a concerted action to conserve the Lesser Flamingo (LF) has long been recognized, and stakeholders at a global level workshop in September 2006, developed an "International Single Species Action Plan (SSAP) for global action for the conservation of the Lesser Flamingo". This international document formed the framework basis of this Tanzanian National SSAP, which has been prepared in accordance with the "2005 AEWA Guidelines on the Preparation of National Single Species Action Plans for Waterbirds".

In order to ensure synchrony and harmony, this Action Plan has also drawn heavily on the "2008 Kenyan, National Single Species Action Plan for the Conservation of the Lesser Flamingo". The aim, is to ensure a joint, synchronised trans-boundary initiative. Further, Tanzania also proposed to Ramsar COP 10, a regional initiative, "To form a EAC Network to Implement the Single Species Action Plan for the Conservation of the Lesser Flamingo in the Shared East African Regional Ecosystem". This network involves Tanzania, Kenya, Uganda and Ethiopia (See Annex 1). Although it was not funded by the Ramsar Secretariat, it nevertheless forms a framework for cross-border collaboration to implement this SSAP to take care of a shared stock and shared ecosystem services.

Prepared with the approval of the National Wetlands Steering Committee (NAWESCO) and its technical body, the National Wetlands Working Group (NWWG), the Tanzania SSAP is in line with Tanzania's National Wetlands Strategic Action Plan 2006-2006, and is the product of the NWWG AEWA Sub-committee who is responsible for oversight to monitor and guide its successful implementation.

In addition, recognizing that research is the key to providing the much needed knowledge for the informed decision making to better manage the bird and its habitats, Tanzania in 2008, as an off shoot of the Disneynature feature film on the flamingos of Lake Natron, "*Crimson Wing"*, also developed a proposal, the *"Global Action for the Sustainable Management of Lake Natron Ecosystem Services for the Conservation of the Lesser Flamingo"* (Disneynature, 2008) (Annex 4). This latter outlines the knowledge gap, and went on, together with Ramsar Secretariat, AEWA, Disneynature, Wildlife Conservation Society (WCS) and World Wide Fund for Nature (WWF), to develop as a proposed "Trust Fund for the Lesser Flamingo" (Ramsar 2008). This was a mechanism to fund the research and subsequent development needs. This fund is in abeyance, due to the global economic downturn, but nevertheless, the research plan forms an important supplement to this Plan, and is included as part of TAWIRI's future research agenda.

The SSAP emerges with support from the 2004-2013 Danida financial and technical support to Sustainable Wetlands Management Program (SWMP). This Program support, had a component for Lake Natron, entitled, *"the Establishment of a Management Framework for Lake Natron, for Improved Livelihoods"*. The approach here is that this SSAP is a foundation to the development and implementation of the Integrated Management Plan (IMP) of the Lake Natron Ramsar Site (a draft is given in Table 14). Since 2007, implementation has been underway through the District Development Plans (DDP) of the 2 districts, namely Ngorongoro and Longido. This entails the involvement of the local community, local private sector and NGOs (Birdlife International and African Wildlife Foundation – AWF), in the conversion of 2 Game Control Areas (GCA)(ie Lake Natron North and South), into a Wildlife Management Area (WMA).

This SSAP therefore guides the way for the mainstreaming of Lesser Flamingo conservation into the associated local government plans (at district and village level), associated protected area (PA), or WMA or wetland IMP or GMP, and is linked to the national agenda on CBNRM of wetlands through WMAs, national wetlands research agenda and national training in wetlands, and is geared for trans-boundary cooperation.

1.2. Timeline of Preparation of this Action Plan

Milestones in the development of this SSAP are as follows, in accordance with the steps in the AEWA Guidelines:

Step 1: Identification of a Coordinator:

a. **July 2006:** 12 SSAPs, including LF, are included in the NAWESCO 3 year Strategic Plan 2006/7-2008/9.
b. **July 2008:** Wetlands Unit, as Secretariat to NAWESCO and its technical body, NWWG, as the coordinator of AEWA and RAMSAR related activities, takes up the responsibility to coordinate preparation of the Lesser Flamingo SSAP, through the NWWG AEWA technical sub-committee, supported by Danida.

Step 2: Identification and Prioritization of additional species requiring a SSAP:

a. **August 2006:** First national meeting on the LF SSAP to input into the context of the International LF SSAP.
b. **September 2007:** Workshop in Nairobi on the International SSAP for the Lesser Flamingo.
c. **February 2008:** RAMSAR mission on Lake Natron Soda Mine, EIA, involves consultation with Kenya and Uganda. Agreement is reached on importance and need to prepare jointly a Lesser Flamingo SSAP, a joint Regional LF SSAP Network (Annex 1) and a draft framework for an Integrated Management Plan (IMP) for Lake Natron, is prepared (Table 14).
d. **April 2008:** Proposed regional network on Lesser Flamingo SSAP sent to Ramsar COP 10 (Annex 1). Proposal was not funded.
e. **November 2008:** LF SSAP placed on TAWIRI National Research Agenda during a workshop by the NWWG Research sub-committee.
f. **September 2008:** Proposal sent to World Bank to host donor support for SSAP. Meeting did not take place.
g. **January 2009:** Funding proposal sent to IUCN, WCS and BirdLife partner's to seek donor support for SSAP and for regional, consultative workshop. Funding did not materialise.

Step 3: Identification of Working Groups:

a. **July 2008:** AEWA Sub-Committee of NWWG is assigned as the coordinating body for the SSAP, assisted by its secretariat, the Wetlands Unit and lead agents, WCST and TAWIRI.
b. **January 2009:** Kenya and Tanzania BirdLife partner's second regional meeting, to develop the action plan to support development of the LF SSAP. Little financial support was forthcoming to support the preparation of this SSAP.
c. **March 2009:** Through NAWESCO, WU decide to continue the LF SSAP preparation under Danida support.

Step 4: Status Report as Background Data:

a. **May 2008:** Stakeholders meet to discuss how to integrate Lake Natron IMP into District Development Plans, outline key concerns.
b. **September 2008:** Research plan for Lesser Flamingo developed with DisneyNature, as part of the background to the SSAP.
c. **April 2009:** Wetlands Unit carry out rapid "survey of key wetlands sites" for Lesser Flamingo and collect data for draft Background Report to LF SSAP.

Step 5: Production of SSAP as per Format:

a. **July 2008:** Kenya and Tanzania BirdLife partners first regional meeting to develop first draft logical framework for the Lesser Flamingo SSAP.
b. **April 2009:** WU prepare first draft Background Report for Tanzania SSAP for Lesser Flamingo.
c. **May 2009:** NWWG AEWA Sub-committee meet, review zero draft SSAP background report, and produce first draft Tz LF SSAP.
d. **January 2010:** BirdLife secured funding from Jensen Foundation to support development (and implementation) of LF SSAP, around Lake Natron.
e. **February 2010:** Regional stakeholder consultative meeting held to review and endorse the final Tz LF SSAP.
f. **March 2010:** Final draft LF SSAP presented to NWWG for approval and forwarded to NAWESCO for

endorsement.

g. **February 2012:** Final LF SSAP goes to print and lodged with AEWA Secretariat for comments and approval.

Step 6: Implementation of SSAP:

a. **July 2008 onwards:** LF SSAP has been mainstreamed in 2 key districts development plans.
b. **June 2009:** Project Manager Lake Natron appointed. This post is fundamental to implementation of Tz SSAP in Natron.
c. **May 2010:** Lake Natron stakeholder orientation of key districts, Protected Area (PA) management, NGOs and development partners of AWF support to Lake Natron WMA, to implement SSAP and include monitoring through the District (Wetlands) SOER.
d. **July 2010: (onwards):** LF SSAP implemented through district and Protected Area management plans.

Step 7: Monitoring of Implementation and Impact:

- **May 2010 (onwards):** Wetlands Unit, Director Sector Coordination (DSC) PMO-RALG and Royal Danish Embassy (RDE) undertake annual monitor of LF SSAP progress around Lake Natron, through district reports.

Step 8: Reviews:

- **May 2013 (onwards):** Rolling reviews and updates shall take place by AEWA Sub-committee of NWWG, every 3-5 years so as to align appropriate actions based on results on the ground.

1.3. Approach Adopted in Preparing this Action Plan

Stakeholders in Tanzania, in February 2008, following the Ramsar review mission of the Lake Natron Soda Mine ESIA, develop the framework for an Integrated Management Plan (IMP) for Lake Natron (Table 14). The IMP was to be based on implementation of a National Action Plan for the Lesser Flamingo through the creation of a WMA. This was driven by the realization that the need for conservation of the Lesser Flamingo in Tanzania had elicited a lot of global attention due to the proposed Soda Mine and its ESIA. The way forward therefore requires a coordinated, multi-stakeholder, multi-national and multidisciplinary approach and action. Development of a LF national action plan would help in focusing action, and by engaging a multiple of relevant stakeholders, would bring about coordination, deriving synergy and commitment to a common cause.

This National Action Plan was therefore developed through a process that included:

- A draft threat list by key lake (Table 2) (Annex 2).
- A draft logical framework (Table 15).
- A Background Report.
- A review of what was known and published of the Lesser Flamingo biology (Annex 5).
- Learning from the makers of the Disneynature movie, Crimson Wing.
- A research proposal for Lesser Flamingo and (Annex 4)
- Development of a proposal for a regional initiative (Annex 1).

Throughout, the AEWA/CMS International Action Plan was used as a guide. Its domestication however, has drawn extensively on the Kenya National Action Plan. It was considered crucial that Kenya and Tanzania are in synchrony. The first draft, as a Background Report was subsequently edited by the AEWA Sub-committee of NWWG. It was then presented to a national/regional stakeholder consultative workshop, as the basis for finalization of this document, before going to NWWG for approval and presentation to NAWESCO for endorsement. The broad based consultation was not as wide as had been originally planned. Primarily, this was because local donor support did not materialize. The Lake Natron Trust Fund between Ramsar and AEWA/WWF/WCS and Disneynature never took off and regional support, had to await funding of BirdLife through Jensen Foundation. This took time, and did not allow funding for engagement of all stakeholders. The preparation was therefore dependent on Danida funds for preparing Lake Natron IMP.

The Action Plan has a lifespan of 10 years, a medium term budgeted action plan of 5 years. It is a rolling plan, guiding implementation through national, local government and protected area managers. As such, it shall be

reviewed and updated every 3-5 years, along with the normal decentralised, local government MTEF planning cycles. An emergency review will be undertaken if there are sudden major changes or local investments liable to adversely affect the population. Monitoring and evaluation of the progress of the action plan in meeting its objectives shall be carried out once a year by the AEWA Sub-Committee of NWWG, in accordance with decentralised progress reporting, and annual evaluations (Table 16).

2.0. CURRENT STATUS OF LESSER FLAMINGO

2.1. Taxonomy

Taxonomic Classification

Kingdom:	Animalia
Phylum:	Chordata
Class:	Aves
Superorder:	Carinatae
Order:	Ciconiiformes
Family:	Phoenicopteridae
Genus:	*Phoeniconaias* (G. R. Gray 1869)
Species:	*Phoeniconaias minor* (Geoffroy Saint-Hilaire 1798)

Scientists consider that the taxonomic relationships of flamingos have been difficult to establish. Historically, they have been thought to be most closely related to Anseriformes (geese), Charadriiformes (wading birds) or Ciconiiformes (storks) by different researchers. Recent DNA analyses have shown that flamingos are most closely related to the Podicipedidae (grebes).

They are divided into two clades based on their genetic similarities: one containing *Phoenicopterus ruber*, *Phoenicopterus roseus* and *Phoenicopterus chilensis* and the other containing *Phoeniconaias minor*, *Phoenicoparrus andinus* and *Phoenicopterus jamesi*.

2.2. Distribution and Population

2.2.1. Global Distribution and Population Status

Tanzania Lesser Flamingo Fact File:

Natron is the only site the EAC Lesser Flamingo's breed (ie. Kenya, Uganda, Tanzania & Ethiopia)
2.5 million birds, 75% of global population, depend on breeding and first feeding at Natron.
9 East Africa soda lakes (ie Kenya & Tanzania), are the feeding range of the EAC Lesser Flamingo.
25 USD million/year is the estimated tourism value of Flamingos to the EAC.

The Lesser Flamingo (*Phoeniconaias minor*), the smallest flamingo species in size, is a spectacular bird of high and diverse ecological and economic values in tourism and zoos. Despite being the world's most numerous flamingo, this bird is currently classified as globally "Near Threatened" by the 2008 IUCN Red List of Threatened Species (BirdLife International, 2008). The main reason for this is that the bird has very few breeding sites with only 5 *"known natural breeding"* sites globally and a single artificial site. All these sites are threatened by either anthropogenic actions (mining, agro-industry and pollution) or the early affects of climate change (a drying climate in southern Africa). There is also a downward trend in the global population estimate. Counts suggest a 20-40% decline in recent decades and if this trend were to continue it would soon meet IUCN criteria for up-listing to "Vulnerable" status.

The Lesser Flamingo red list report has more accurate listing of reasons for the Near Threatened classification (http://www.iucnredlist.org/details/144723).

The largest regional sub-population, estimated at 75% of the total global Lesser Flamingo numbers, occurs on the 9 alkaline-saline lakes of the Great Rift Valley in East Africa (Figure 1). This East African sub-population faces

many real and potential threats (Table 7, Annex 2 & 3) as indicated by recent mass die offs of tens of thousands of birds.

Key among these threats are:

a. **Economic Development:** Large agro-industry demand for water for commercial irrigation, mining, hydro-power and a more long standing threat, soda ash extraction from Lake Natron. Literature shows that the soda ash proposal is as old as 1996, was proposed again in 2007, but currently in abeyance subject to the EIA.
b. **Livelihood Pressures:** Low river flows affecting water cycles and sedimentation of feeding grounds due to catchment overgrazing and deforestation for fuel or due to fire damage, and loss of water due to small scale catchment irrigation, pollution, disease and habitat loss.
c. **Global Climate Change:** Conditions of these alkaline lakes are exacerbated by the harsh, but fragile climate zones preferred by the bird, desert like, where droughts are rather frequent, the intensity of which are likely to increase due to climate change.

Lesser Flamingos have many important roles, both economic (through eco-tourism) and ecological. Their populations and concentrations in East Africa are unique and of global, regional and national conservation concern, and economic value (ie whereas the tourism value in Tanzania may be a low USD 1-5 million, in Kenya its estimated of USD 26 million, BirdLife pers obs). The birds are sensitive and respond to seasonal (and manmade) changes in the environmental conditions of their habitats. Their movements between the lakes are indicative of the nature of the inter-connected, inter-dependent linkages between food chains, ecological and biological, shared between the saline-alkaline lakes in the region (Figure 1), but the details of which are virtually unknown. For this reason, any action plan must call for regional and trans-boundary actions (as in Annex 1). The publicity of the suspected recent decline in population numbers and the world press given to the proposed Lake Natron soda mine, and the recent Disneynature feature film, *"Crimson Wing"*, has brought the plight of the Lesser Flamingo to the attention of international conservation organisations and global agreements. This in turn has led AEWA to suggest the need for special actions to manage the birds, to mitigate their declining trends, and a call to global action, by asking countries to produce National SSAPs.

Estimation of the total global population varies due to different counting techniques. The nature of the bird's habitat and its irregular, often nocturnal mass movement between lakes, makes accurate estimates problematic, particularly as methodologies are not standardized and that estimates fluctuate wildly between observers, and the time difference between studies. Compounded by the fact that as birds tend to fly at night, they can be here today, gone tomorrow, making total counts impossible! Composites of high and low counts of global non-breeding populations over the past 10 years, suggest a wide range from 865,000 to 2,720,000 (a mean of 1,750,000 birds), of which the east Africa sub-population ranges from 830,000 to 2,200,000 (a mean of 1 million) (Table 1).

Four separate regional populations are recognised for conservation purposes (Table 1). It is known that some interchange occurs between the East and West African populations and it is suspected between Southern and East African populations as these are genetically similar and stable. It is also likely that there is irregular movement between East African Rift Valley sites and those on the Indian sub-continent, but the full significance and extent of these connections is unknown

The regional sub-populations are:

a. **East Africa:** Between 1.5 and 2.5 million: >75% of total, occurs mostly on the nine alkaline-saline lakes of the Great Rift Valley in East Africa.
b. **India:** Approximately 400,000 occur in north-western India and Pakistan centred on the Rann of Kutch or Kachchh (Kutch is the Pakistani spelling) but breeding is irregular and subject to much disturbance.
c. **Southern Africa:** Between 55,000 and 65,000: Are estimated to be, in southern Africa but this population is currently in decline due to poor breeding success at the two main sites (Simmons & Versfeld in press), and McCulloch (in press). These numbers could be a feature of the recent poor breeding success at Etosha Pan and Sua Pan (Botswana), or a reflection of the success of the new, man-made breeding site at Kamfers Dam, or due to some other factor that needs to be explained.
d. **West Africa:** Between 15,000 and 25,000 are estimated from counts in West Africa. A tiny population that is almost certainly not sustainable without immigration from other regional populations as the only known

breeding site is under increasing threat. Reported to have breed in 2009 at Aftout Es Saheli, in Mauritania (Sidaty and Daf, 2010).

Figures given above are taken from Wetlands International (2006). It is always difficult with an itinerant bird like this to predict if the counts are accurate and statistically/scientifically valid across Africa and across time, given differences in observers, methodologies and the birds movement patterns? Different observers tend to extrapolate out from counts in different ways and this creates wildly differing results as there is no standardised or regular, unbiased method. The numbers are therefore indicative and not absolute!

2.2.2. Distribution and Population Status in East Africa:

Recognising that any Tanzania national SSAP for the Lesser Flamingo cannot be de-linked from the regional population, in-order to ensure harmony, this section includes reports from the 4 countries that share the same sub-population. These birds are potentially one and the same itinerant population, that share the same gene pool and ancestry.

a. Tanzania

In Tanzania the Lesser Flamingo is largely confined to the Rift Valley soda lakes of which 50-60% occur inside or adjacent to protected areas (Figure 1, Table 2 and 3).

Concentrations that meet the Ramsar criteria of 1% population (ie 20 000) have been counted at Lakes: Natron, Eyasi, Manyara, Magadi, Empakai, Momella, Ndutu, Burunge, Balangida Lalu, Kitangiri and Singida. (Baker & Baker 2002, Mlingwa & Baker 2006), and Bahi Swamp (Baker in prep) and most likely occur at these sites on a regular basis. Lake Rukwa, which will be the key lake for movement between Eastern & Southern populations most probably holds high numbers on a regular basis but has never been counted, and the local PA management notes birds have been absent in recent times.

High concentrations often exceeding several hundred thousand birds, occur at lakes: Natron, Manyara (Figure 5), Empakai and Eyasi.

Large numbers are seldom seen far from the Rift Valley, but records by Tanzania Bird Atlas Project (TBAP) show a wider dispersal range (Figure 2) (Baker & Baker in prep). Successful, breeding in Tanzania has only been recorded at Lake Natron during the past 50 years, but practice nest building has been observed at Lakes Rukwa, Momella, Manyara and Eyasi (Baker pers comm), but outside of Natron, no records show successful breeding elsewhere in Tanzania, and there are no records of any kind pre-dating this statistic from Tanzania (Table 5).

In East Africa, the population in the period 1990's to 2009 estimated at different times throughout the year, fluctuated between 1.5 and 2.5 million birds (Table 2). Due to the fluctuation in numbers and irregular data, it is not possible to draw much fact from the national population estimates.

Distribution quality data in Tanzania is good as it is derived from the Tanzania Bird Atlas Project, based on 1 150 observations reported by birdwatchers nation-wide, and covers all months of the year (Figure 2). Population estimates data however is weak as there has never been a coordinated regional nor national census. The large estimate range is the result of infrequent counts (often only estimates) that ignore large-scale movements of birds among sites and range states, resulting in low minimum counts and high maximum counts for individual sites. In particular, the minimum counts are rather meaningless especially as they rarely, if ever, represent a total count of any particular site. Several of the Rift Valley floor lakes (which are rather shallow) can be completely dry in years of poor rainfall, hence zero would be a minimum. In addition, data is subject to seasonal variation, which can be high as exhibited by recent counts on Lake Manyara. Figure 5 shows a seasonal range from 9 to 640 thousand birds. The data is therefore only indicative of population numbers.

Lesser Flamingos have also been recorded in several other sites, but in lower numbers including: coastal salt

works and intertidal habitats (Table 2 and 3).

b. Kenya:

In Kenya, the Lesser Flamingo is largely confined to the Rift Valley soda lakes (Figure 1, Table 4). Major concentrations are found at Lakes Nakuru, Bogoria and Elementeita. Concentrations of feeding birds could once upon a time exceed one million at lakes Nakuru and Bogoria (But this has not been the case within the past 15 years)(see below). They are seldom seen far from the Rift Valley.

In Kenya the national population, in the period 1992 to 2007 estimated in the months of January, fluctuated between 280,000 and 1,450,000 birds with a mean of 940,000 (Figure 3). This is a non-breeding population, but a few attempts have been recorded (Table 5). In most years, the national population estimates were above 750,000, while low estimates of less than 400,000 birds were recorded in the years 1996, 2004, 2005 and 2007. Data quality in Kenya is good for lakes counted on a regular basis. It is derived from the past 20 years of regular bi-annual waterbird counts. The large estimate range is the result of frequent large-scale movements of birds among sites and range states, resulting in low minimum counts and high maximum counts for individual sites. Here again, the minimum counts are rather meaningless as several lakes are known to dry out completely in extreme years, with zero birds.

Lesser Flamingos have been recorded in several other sites, but in lower numbers including Lake Magadi, Lake Naivasha, Lake Simbi, Amboseli National Park, Dandora Sewage Ponds, Lake Ol Bolossat, Dunga Swamp, Lake Baringo and Mombasa Salt Works among other sites, especially along the coast.

c. Uganda:

Estimated population ranges from 44 to 17,000 with a 1999 high of 62,800. This is a non-breeding population in alkaline soda lakes, 97-100 % in protected areas, all IBAs, but none in Ramsar Sites.

Found in Lake Kasenyi, Lake Kyambara, Lake Munyanyange and Lake Nyamunuka.

d. Ethiopia:

Estimated population ranges from 3,300 to 24,000 with a 1992/3 high of 243,000. This is a non-breeding population, 18-38% in protected areas, 100% in IBAs, but none in Ramsar Sites.

Found in several locations: Akaki-Aba Samuel wetlands, Lake Abijata, Lake Awassa, Lake Chitu and Green Lake. Believed to have breed in 2005 in Lake Abijata, producing 3,000 chicks.

2.3. Migratory Movements

2.3.1. Global movements

The Lesser Flamingo is regularly seen in 30 countries from West Africa, across sub-Saharan Africa and along the SW Asian coast to South Asia, and occurs as a vagrant in 26 additional countries and territories. However, its global population is concentrated in 73 sites, in just 12 primary range states, each of which regularly holds >1% of the breeding or non-breeding population (over 20,000 birds). Lesser Flamingos are regularly found in the geographical region of West Africa, East Africa, Southern Africa and South Asia. Confirmed regular breeding is confined to only five natural (and one manmade) sites in four of these countries.

When not breeding, the Lesser Flamingo occurs in virtually all sub-Saharan countries and from the Arabian Peninsula to India. It is an itinerant species with flocks constantly on the move between feeding sites that are often in different countries and several hundred kilometres apart. These movements occur mostly at night.

2.3.2. East African Movements

The Lesser Flamingo is highly nomadic. In East Africa, the number of individuals on a given lake has been shown to double or halve in a period of just two weeks (Figure 5). This makes total counts difficult, renders the estimates above meaningless, and makes management of stocks impossible.

To understand individual movements of flamingos, a four-year study, was undertaken (from October 2002) at Lake Bogoria, with satellite transmitters affixed to seven adult male Lesser Flamingos (Figure 4). The individual birds showed different movement patterns, which included frequent visits to a network of sites. The study showed that the key sites network for Lesser Flamingos in East Africa consists of seven alkaline lakes in Kenya (Logipi, Bogoria, Nakuru and Elementeita) and Tanzania (Natron, Manyara and Eyasi) and an ephemeral fresh/ alkaline wetland in central Tanzania (Bahi Swamp). The total distances individuals travelled during the study period varied from 684 km to 19,750 km, some flying a distance of >900 km away from the tagging site. What was significant about this study is that the birds all followed the same flight path, a straight line up and down the Rift Valley, visiting the same select lakes (Childress 2007; B. Childress, pers. comm.). None of these birds visited the coast or any of the many peripheral sites, and none left the East Africa region.

A satellite tagging study of 3 Greater Flamingos in Tanzania showed similar North-South movements along the Rift Valley but with two birds visiting the coast for varying amounts of time (Baker et al., 2006).

2.4 Protection Status:

In Tanzania, the level of protection offered to Lesser Flamingo can be demonstrated by:
a. The protection status of the sites it occupies (Table 3).
b. International and regional conventions which are of relevance (Table 8), and
c. Relevant national laws, policies and institutions that protect the species and its habitat (Table 9).

The Lesser Flamingo is a protected species (internationally) and it is illegal to deliberately set out to kill, capture (young or adults) and to trade in live animals, or their products, or to destroy their nests or harvest their eggs in all of the primary range states, including Tanzania. Only in Tanzania, it is perfectly legal to trap, maintain in captivity and export lesser flamingos provided permits are first obtained from the Director of Wildlife. This protection is derived from the above international treaties and national legislation, and in Tanzania, through village by laws, plans are to include this in local government legislation, through the WMA process. The penalties vary among countries, include heavy fines and jail sentences. The Tanzania quota for trade in live Lesser Flamingos is 1,600/ year.

The recent interest in flamingos caused by the campaigns against the Soda Mine on Lake Natron, means that generally, the attitude of the public and conservation authorities in Tanzania, toward the Lesser Flamingo is positive, although it is not well known among the public in those lakes in more isolated, and inhospitable places. Conservation authorities in Tanzania, consider the Lesser Flamingo a species of special concern that needs to be protected. As a result, in 2001, Lake Natron was established as a key Ramsar site, and several other sites are in protected areas or declared IBAs (Table 3).

Facts About The Natron Ramsar Site

Ramsar Site No: *1TZ002*
Site Name: *Lake Natron Basin*
Designation Date: *04-07-2001*
Coordinates: *02°21'S 036°00'E*
Elevation: *600 m - 3000 m*
Ramar Site Area: *224,781 ha*
Location: *Ngorongoro and Longido Districts, Arusha Region, Northern Tanzania.*
Transboundary: *Contiguous with the Kenyan catchment.*
Ramsar Criteria: *1 ,2 ,3 ,4 ,5 ,6 ,7*

- 100% of the EAC and 75% of the global population of Lesser Flamingo, breed at Natron.
- 3 Acalapia cichlid fish species are endemic to Natron (with more suspected speciation).
- *Spirulina platensis* an alga, is unique to Natron, and critical to Lesser Flamingo feeding.
- 100 000 Palaeartic, migratory water birds.

- Lake Natron is located in the mid-north of Tanzania, sharing a catchment with Kenya.
- 600 m altitude, located on the Rift Valley floor (of volcanic origins).
- 400-600 mm rainfall/year (semi-desert conditions prevail).
- 1900 mm/year annual evaporation (= 1750 million m^3/year over total surface area).
- 907 million m^3 annual water inflow (no outflow).
- 65 km long and 15-20 km wide.
- 930 km^2 total lake surface area (ie water and salt islands = "trona").
- 80-90 km^2 (10%) is saline or freshwater lagoons (22 lagoons in total).
- 850 km^2 is covered in a dry salt crust (= "trona", 43 cm thick) on top of brine (like "ice on a pond").
- 28 saline or freshwater hot springs (32-50 ^oC) or rivers, feed the Lake.
- 7 000 km^2 closed catchment (mostly fragile volcanic soils).
- 2 m average depth (of trona and brine)(maximum 5-6 m).

Tanzania is aware of the wildlife spectacle that flamingos bring, and is conscious of the special tourist generating potential of the species. Flamingos appear as a symbol of tourism, an icon of conservation in most advertising brochures to promote tourism, nature parks and zoos. The districts of Monduli, Ngorongoro and Longido have all developed local tourist entrance fee by laws, collecting revenues from foreign tourists who wish to see the flamingos of Lake Natron. Tourists, estimated at 5,000/year, are not much attracted to Natron for the birdlife/ flamingos, due to the difficulty to see birds up close, but this is changing. Local guides are becoming much more aware of the potential to show tourists places like the Monik lagoon for example, and are already carving out many hikes in the surrounding rift, and alluring, rugged volcanic landscape, and its unique geological presence.

2.5 Relationship With Other Biodiversity Strategies And Projects

There are several National Policies, Strategies and Action Plans that have direct relevance to Lesser Flamingo conservation and protection of their ecosystems in the Rift Valley Lakes in Tanzania (and Kenya). Effective and coordinated enforcement and implementation of these policies and strategies will enhance the status of flamingo conservation. Examples include (Table 9):

Examples of National Policies that Impinge on Flamingo Environments

National Biodiversity Action Plan and Strategy,
National Environment Action Plan (NEAP),
National Forest Policy,
National Wildlife Policy,
National Climate Change Action Plan Framework,
National Desertification Action Plan and Strategy,
National Water Conservation and Management Policy and Action Plans,
National Land Use Policy,
National Agriculture Policy,
National Irrigation Policy, and
National Wetlands Strategy (draft).

A review of projects in Tanzania and in the neighbourhood of Lake Natron and other Rift Valley Lakes in Kenya that impinge on the Lesser Flamingo, are listed in Table 11.

2.6. Habitat Requirements

Lesser Flamingo habitat use and food requirements are generally well known. The species depends primarily on shallow saline/alkaline lakes, wetlands and coastal areas because of its specialised diet of filter feeding, of microscopic alkaline cyanobacteria (blue green algae) and benthic diatoms.

Breeding Season:

Breeding periods are erratic, depending on the timing of seasonal rains, but most breeding occurs:

Breeding Seasons in 5 Global Breeding Sites

1. November and April in Botswana.
2. November and January in Namibia.
3. September and November in South Asia (India).
4. November and February in southern Africa.
5. October and January in Tanzania.

Breeding however, can occur all year round in Lake Natron, if conditions are right (Figure 6 and Table 6). Large colonies are evident after large rainfall events. Regular smaller colonies on fringes of Gelai flats occur even during the dry season, on retreating water edges. Suggests the bird has adopted, too, a dry and wet season strategy (Aeberhard, per obs). Regular breeding in West Africa has not been confirmed, but incidences have been documented (Sidaty and Daf, January 2010 in Senegal Delta, West Africa). During breeding periods, if there has been sufficient rainfall and breeding conditions are suitable, Lesser Flamingos congregate at the above 5 well-known and regular breeding sites, frequently in large mixed breeding colonies with Greater Flamingo.

The East African population has not bred outside of Lake Natron, Tanzania, in the last 50 years. Past records (Table 5) show that it bred in large numbers in Kenya at:

- Magadi (1962).
- Turkana (1957).
- Logopi (1978).
- Bogoria (1979/80). Attempts perhaps at practice nesting.

The four other known, regular, large scale natural breeding sites, and a few vagrants, notably:

- **East Africa:** The only known breeding site currently in East Africa is Lake Natron.
- **Southern Africa:** Two regular natural breeding sites in southern Africa (Makgadikgadi Pans in Botswana, 800 pairs in 1978 and 54 000 pairs in Etosha Pan in Namibia, in 1971).
- **South East Asia:** Two in India (Zinzuwadia and Purabcheria salt pans). The site near Bela in Great Rann of Kachchh in India, reported 1000-2250 breeding pairs in 1973, has yet to be documented.

Yet to be confirmed are:

- **West Africa:** Breeding at Aftout es Sâheli in Mauritania in 1965, 900 pairs (but has yet to be confirmed). (See de Naurois, R. 1965) and 2400 couples in January 2010 (Sidaty and Daf, 2010).
- **Ethiopia:** Breeding at L ake Abijata, in Ethiopia, in 2005, produced 3,000 chicks. (See Flamingo 16, 2006).
- **Zambia:** Breeding in Mweru Wantipa Lake in Zambia, in 1955, some 630 breeding pairs were believed unsuccessful. (The Lesser Flamingo is now considered a rarely-seen vagrant in Zambia, Childress et al., 2008).

Of these breeding sites, only Etosha Pan and the two sites in India are officially protected.

Breeding on a new artificial island, has also been recorded in S. Africa, notably:

- **S. Africa:** Kamfers Dam in S. Africa, a recent, man-made, protected breeding site, in 2008, produced 9,000 chicks.

Although this site is under increasing threat from urbanization it has shown that “artificial islands” are worth considering and indicates that a shortage of suitable nesting sites is a key constraint to the survival of the species. This also suggests that natural breeding areas could be enhanced with man-made interventions.

Breeding habitat requirements:

Key to breeding success of the Lesser Flamingo are:

a. Inaccessibility: Inaccessible to, and minimum disturbance from humans, mammals and avian predators.

b. **Seasonal Flooding:** Subject to seasonal flooding that is shallow (and calm), but sufficiently deep and long lasting to soften the nesting material and prohibit terrestrial predators from land access, reaching the nesting colony. Seasonal flooding not only triggers nesting but helps to protect nests.
c. **Caustic Waters:** Preferably waters of a caustic nature to add to the "moat" effect of protecting nests and young, and of enhancing primary production of the flamingo's food, cyano-bacteria.
d. **Nest Material:** Material that is soft enough a quantity (ie one nest weights 7 kg) to excavate within reach of the nest site, yet will harden to form the nest mound and will resist weathering from light rain (and not too muddy!).
e. **Abundance of Food:** Within easy "suitable" reach or days flying distance or from the lake, of a good "reliable" feeding site for the parents (eg Birds feed at Manyara and Empakai when nursing young at Natron).
f. **Availability of Freshwater:** With suitable freshwater springs/supply for juvenile birds to either drink and bathe (or for dilution of lake brine to produce suitable environment for primary production or for enrichment of organic muds as food for pre-fledging stages)(See below).
g. **Available Juvenile Feeding:** Now considered more important, are mud-flats were young can find food supplements in the organic muds. At some point the chicks, fledged or not, start to self provision. Matt Aeberhard (Pers Obs, 2008) witnessed (and filmed) young unfledged chicks stirring up muds with feet and beak, drinking the stirred up liquids and physically ingesting mud lumps. Further, fledged juveniles were observed to spend significant time at Natron after leaving the colonies, starting to feed on benthic diatoms with increasing efficiency as parental provisioning declines, and filter feeding dentition develops. Whether this food supplement is necessary for successful breeding, or simply advantageous to recruitment (by providing additional, supplementary nutrition) is a point to be researched.

The hot springs at Natron do have a role in the breeding and recruitment of flamingos, providing relatively fresh water, rich in mineral nutrient from the underground springs, creating areas of rich, organic muds as nursery feeding grounds. Without this supplement, Root and Brown (1975) observed young at Lake Magadi took an additional 20 days to fledge, extending fledging time from 70 days at Natron to 90 at Magadi. Could the 30% increase in time represent the proportion of food the young self-provision in Natron, which was not possible in the nutrient poor Magadi?

Feeding habitat requirements:

Key to the feeding biology of Lesser Flamingo are:

a. **Hydro-chemistry:** Water chemistry that enables high productivity and growth of cyano-bacteria and diatoms, as food for both adults and juveniles.
b. **Mud Surface:** Wet mud supporting the growth of diatoms and organic material (ie Awfuchs = organic muds).
c. **Calm Waters:** Several hours each day when the surface of the water is sufficiently calm to enable the flamingos to filter feed. If the surface of the water is not calm, they are unable to feed and are confined to the limited areas of wet mud.

2.7. Biology and Ecology

2.7.1. Productivity & Survival

Individual Lesser Flamingos, it is believed, do not breed annually and their clutch size is one. Between 1953 and 1962, estimated mean breeding success in five major breeding attempts observed at lakes Natron (Tanzania) and Magadi (Kenya) was 41-43% (range: < 5% - 70%) of eggs laid (Brown and Root, 1971). Most of the mortality occurred during the first three weeks. Key sources of loss were (Figure 6):

a. **Predation:** Predation (ie. marabou storks, fish eagles and vulture have been reported). Brown & Root (1971) believed the main predator at the time was the Egyptian Vulture. Matt Aeberhard (Per obs, 2008) observed no vultures at all at Natron (but did see lappet faced vulture predation in Botswana). He did observe that fish eagles predate chicks at Natron, along with other eagles (ie tawny eagles, steppe eagle), and witnessed significant direct marabou predation. The consequences of the latter, included considerable nest desertion,

and the scattering through panic of chicks (which might explain numbers of lost and starving chicks on the flats). Direct predation and indirect predation (through disturbance) are totally linked in this case. Aeberhard also witnessed to a lesser degree, predation of chicks by jackal as the crèches made landfall on the eastern shores, and occasionally by marsh mongoose.

b. **Desertion:** Nest desertion (due to disturbances by predators, tourists, low flying aircraft, etc).
c. **Mud Traps:** Getting entrapped in the mud surrounding the nesting area.
d. **Soda Anklets:** Anklets of soda forming on the legs "and body". Matt Aeberhard (Pers comm 2008) observed, often chicks have accreted soda on plumage. Some bills and eyes were observed welded shut.
e. **Egg Deaths:** Heavy rainfall during breeding can lead to soda accumulation on the eggs, suffocating the embryo, leading to pre-hatch mortality. This has given rise to several reports of alleged "nesting failure", which in fact are dead eggs washed up in next seasons floods.

Lesser Flamingos can live upto 40 years in the wild. This was estimated from the recapture of a bird ringed 41 years earlier by Brown and Root (Childress 2004). They have an estimated generation length of 22-24 years. There is insufficient data to estimate annual mortality/survival.

2.7.2. Life History.

Lesser Flamingo Profile:

- 40 year average life span.
- 3-4 years to maturity.
- 28 day incubation period, both sexes incubate.
- 80-90% hatch rate (loss due to nest drowning, salt accretion, predation, abandonment due to stress).
- 70 day to fledging (Fed daily by parent's "crop milk", sourcing food at night from nearby lakes).
- 8 day leave nest, form crèche.
- > 30 day first feeding in organic mud (Far more significant than earlier recorded).
- 40 % success rate (loss due to predation, salt accretion, injury, separation due to stress).
- 3 months immature birds continue to feed (before first flight out of the Lake).

***Breeding*:**

Believed to reach sexual maturity at 3-4 years of age, Lesser Flamingo adults generally breeds following seasonal rains that provide the flooding necessary to isolate remote breeding sites from terrestrial predators and provides the soft muddy material for nest building. Nests are built from soda and mud or crystalline soda substrate. Mean incubation is 28 days. Chicks leave the nests at 6-8 days and migrate in crèches to water or feeding areas. Fledging takes ~70 days (although the one time recorded breeding took place in Lake Magadi, it took 90 days). Lesser Flamingos do not breed readily in captivity, but have breed in a man-made island (Kamphers dam, S. Africa).

***Feeding*:**

Feed on species of microscopic cyano-bacteria and benthic diatoms found only in alkaline lakes, saltpans, saline lagoons and estuaries. Feed primarily by walking and, in deep water, swimming, filtering the algae and diatoms with a specialised bill that contains up to 10,000 microscopic lamellae. Pre-fledgling stage is also believed to feed directly on "organic muds" in the shallows of foreshore mudflats, prior to formation of the beak and development of the filter mechanisms (M. Aeberhard, pers. comm.). Aeberhard goes on to observe that when Natron is in full breeding with mass colonies of young, adults are actively seen flying between Natron and Manyara and Empakai potentially feeding themselves so that they can produce sufficient crop milk for the young. Crop milk unique to the species is produced in the crop as a red, milky substance, believed to contain blood.

***Outside breeding season*:**

In Eastern Africa they congregate in huge flocks on major feeding lakes, but can disperse widely amongst the Rift Valley lakes, coastal and other inland water (Figure 1).

2.8. Threats and Potential Threats (Problem Analysis)

2.8.1. Critical and High Threats:

The most "critical" threats to the survival of the Lesser Flamingo are listed in Annex 2 and 3, and for Tanzania (Table 7). Factors causing or likely to cause very rapid population decline of more than 30% over 10 years or three generations, are thought to be:

a. Habitat Loss and Degradation

The loss and/or the degradation of the LF specialised breeding and feeding habitat is affecting its survival, and of particular concern is hydrological changes resulting from activities altering water cycle (caused by river damming and increased water abstraction for irrigation, mining, tourism or domestic needs), bringing about hydro-chemical changes in water quality (due to potential soda mining, drought, over abstraction leading to increased salinity, pollution, or eutrophication due to fertilisers, sewage or industrial effluent run-off, etc). Notably:

1. **Mining Activities:** The loss and/or degradation of the key breeding sites (eg Lake Natron) due to possible mining activities (eg soda ash) and related changes in hydro-chemical balance due to water needs.
2. **Over-grazing:** Catchment damage affecting hydro-logical cycle due to erosion and run-off increase from overgrazing in fragile landscape environments, reducing percolation recharge of ground water (eg. Natron and Eyasi), excessive flooding and siltation of foreshore and turbidity, reducing productivity of lagoons.
3. **Global Climate Change:** Given the fragile nature of the almost desert like ecosystem of alkaline lakes (ie 400-600mm/year rainfall), any slight change in weather pattern would have consequences for the hydro-chemistry (eg Lakes Natron, Manyara and Magadi/Ngorongoro, as witnessed in 2009 drought). Climate change can be over-arching in its effects and this may need adaptation consideration in future revisions to the Tz LF SSAP.
4. **Fertilizer and Pesticide:** Farming in the catchment leading to residues flowing downstream and polluting the lake, could contribute to die outs (eg Lake Manyara).
5. **Abstraction for Human Use/Irrigation:** Excessive use of water for catchment irrigation and domestic needs are reducing flows, affecting hydrology in fragile, shallow lake ecosystems (eg. Lakes Manyara, Bahi, Natron and Burungi). This could be exacerbated by proposals to increase irrigation schemes in the catchments. Consideration needs to be given to more rational, more efficient water use.

b. Toxicology, Disease and Harvest:

- **Agro-chemical:** Due to high levels of agriculture in catchment, likelihood of downstream contamination is high (eg. Manyara).

c. Predation, Competition:

- **Predators:** In particular Marabou and bird predators on Lake Natron.

2.8.2. High and Medium Threats

Threats of "high to medium importance" (factors causing or likely to cause rapid declines, ie 20-30% over 10 years or three generations) were determined to include:

a. Habitat Loss and Degradation

1. **Road Construction:** Bringing dust and disturbance due to close proximity (eg Singida Lake).
2. **Deforestation and Bushfires:** Deforestation from anthropogenic activities like fuel and timber cutting, uncontrolled burning and agricultural clearing is leading to siltation or sedimentation from soil erosion and increased run-off (= reduced percolation), could adversely affect feeding and nesting. Including burning of springs can change the water dynamics.

b. Toxicology, Disease and Harvest:

- **Toxicology and Disease:** Poisoning (particularly by cyano-bacteria toxins) and infectious diseases (mycobacteriosis and avian cholera) exist as potential threats, if coupled with climate or other hydro-chemistry changes.

All other threats, including human disturbance of non-breeding sites, small scale salt extraction, collision with overhead structures, competition with other species for food and breeding sites are perceived as being threats of local importance (factors causing or likely to cause negligible decline). A detailed description of threats is presented as the basis to guide Protected Area, District and village Development Planning, for inclusion in site IMPs and PA GMPs, notably:

a. A listing of general threats (adapted as per International SSAP, to Tanzania) are provided in Annex 2.
b. Threat importance rankings at key core lake sites for Tanzania, are in Table 7.
c. A problem tree analysis of threats (global, but with ranking as presented by Kenya SSAP) (Annex 3).

Despite "protected area" status of some areas, like the NCAA lakes, water extraction in the catchment for tourism, is a big issue for Magadi (ie Ngorongoro crater) lake (from the rim tourist lodges), and Empakai will soon have a new lodge, as will Masek in Serengeti NP (which, by extension this includes Ndutu as they share a water table). Plans for Masek included a de-salination plant (which will increase lake salinity). So there will potentially be possible significant degradation of these sites in the near future.

c. Mass Mortalities:

A recent study by Kihwele (2009) notes mass die-offs in Lake Manyara (and Momella) in July-August 2004. He estimated 15 000 birds, but Park staff estimates suggested 43 850), February 2008 and August-September 2008 (= 1 000). The deaths were concentrated around: Jangwani, Msasa, Endalla, Bagayo, Endabash and Maji Moto areas, mostly along only the western shoreline of the park, along the boundary receiving run-of from Kidatu hills area, a rich agricultural farming area.

Believed was a similarity to deaths in Kenya, from cyanotoxins. Populations were high at the time 640 000- 1.5 million birds. In May 2005, some 37,000 were estimated to have died at Lake Manyara derived from physical counts of dead birds along the eastern shoreline (N. Baker pers. comm.).

Notably, alleged "mass die-offs of birds and eggs" have been reported at Natron, but Matt Aeberhard (Pers com, 2008) notes these reports might in fact refer to dead birds/eggs which were naturally accumulated over significant periods of time (on the soda flat) and washed up into strand lines around the shores during significant flooding events (ie they were not mass die outs as was originally thought, but a wash of last year's dead eggs and juveniles to shore!).

d. Harvesting:

Consideration is needed to make the trade in live birds more sustainable in the long term, but current trade of 1,600/year may not be significant. However, loss due to poor capture and handling, can give rise to a higher loss than these numbers suggest. In addition, captive deaths due to difficulties in feeding artificial forms of food, may result in a high attrition rate, requiring regular top-up by capture from the wild.

2.9. Stakeholder Analysis

Stakeholders and institutions whose activities have a direct impact on flamingo conservation are many and varied. They range from central government, local government, public institutions (ie TAWIRI, SUA, UDSM, etc), civil society groups (NGOs), community based organizations (CBOs), private sector organizations, tourists, landowners and local communities. The key oversight body of this Tz LF SSAP is the NWWG AEWA SC. The stakeholder impacts on LF, range from positive initiatives that support flamingo conservation to negative impacts that may be scaled from low to very high on the species and their habitats, as indicated in Table 10.

2.10. Risks and Opportunities Likely To Influence Success of Action Plan Implementation

There are several initiatives, programmes and activities that have created opportunities for better conservation of the flamingos (Table 11). These need to be integrated, expanded and developed further as a basis of enhancing flamingo conservation. On the other hand, there are many land use and development processes that exacerbate the risks and threats to flamingo conservation. These need to be mitigated through multi-sectoral and inter-regional initiatives as a basis of enhancing flamingo conservation. Some of the risks are:

a. Failure to secure adequate technical and financial support to implement the LF SSAP.
b. Policy makers do not consider LF conservation a priority versus local poverty reduction development needs, and it is not included or not given support in VDP, DDP, GMP, etc.
c. Global climate change continues unabated and exacerbates the local fragile environmental conditions,
d. Inter-regional cooperation fails to contain possible toxicological or disease conditions spreading from one stock to the other.

3. Tanzania Lesser Flamingo Action Program

The following is abstracted from the AWEA International LF SSAP as the over-arching guide of the development objectives of the Tz LF SSAP.

3.1. International Vision, Aim and Objectives

3.1.1. International LF SSAP Aim:

The removal of the Lesser Flamingo from the IUCN Red List of Threatened Species globally and in each of its four regional populations by 2020.

OVI = Based on IUCN Red List criteria.

3.1.2. International LF SSAP Objective:

To **s**tabilize the size and distribution of regional and global non-breeding populations at 2009 levels by 2012.

OVI = Based on a coordinated annual African/Asian Waterbird Census surveys and tri-annual aerial surveys. (Provided a suitable method of counting can be developed).

3.1.3. Key Results to be achieved by International LF SSAP:

1. Ensuring that all key breeding and feeding sites are maintained in good ecological condition. (OVI = measured by water levels, salinity and food prey (micro-bacteria and diatom) at key sites are maintained at levels that are ideal for Lesser Flamingos).
2. Ensuring that breeding colonies are not disturbed by human activity. (OVI = measured by five-year mean level of breeding success at ≥50%).
3. Reducing the effects on regional populations of toxicological and/or infectious diseases. (OVI = measured by mass die-offs in the East African regional population eliminated).
4. Ensuring that harvesting of eggs and trade in live specimens has no effect on the regional Lesser Flamingo populations. (OVI = measured by population viability analysis (PVA) to confirm that harvest is within the safe limits of exploitation, that national legislation on egg harvesting is passed and enforced and CITES recommendations on trade are properly implemented).
5. Minimising collisions with manmade structures. (OVI = measured by number of reported LF mortalities due to collision with man-made structures declined to 25 % of the 2009 level).
6. Minimising human disturbance at non-breeding sites. (OVI = measured by no reports of human disturbance at non-breeding sites).
7. Filling knowledge gaps. (OVI = measured by monitoring reports and research reports in scientific publications and that funding for necessary research can be obtained).

3.2. E Africa, Regional Vision, Aim and Objectives

This is seen as the regional, over-arching guide to the developmental objectives of the EA LF SSAP.

3.2.1. Regional Aim

To stabilize the size and distribution of the regional breeding and non-breeding populations.

3.2.2. Regional Objectives

Regional cooperation between Tanzania, Kenya, Uganda and Ethiopia to harmonise and coordinate the implementation of national LF SSAP, to benefit the East Africa sub-population as a whole.

See Annex 1.

3.3. Kenya's Vision, Aim and Objectives:

The Logical framework of Kenya's SSAP is summarised in Table 13 as a basis to harmonise with the Tanzania SSAP, given that they are the same, shared stock.

3.3.1. The Kenya Vision is:

A stable, viable and healthy East African population of the Lesser Flamingo.

3.3.2. The Kenya Aim is:

To stabilise population size and distribution of the Lesser Flamingo at an average number of no less than 900 000 individuals within the next five to ten years.

3.3.3. The Kenya Objectives are:

a. All key sites maintained in good ecological condition.

b. Disturbance stopped at key non-breeding sites and at sites where birds are known have attempted to breed or to have traditionally bred.

c. Impact of poisoning and diseases on Lesser Flamingo populations reduced.

d. An operational national and regional network and collaboration programme for the conservation of the Lesser Flamingo initiated and sustained

e. Knowledge gaps on aspects of the Ecology of Lesser Flamingo such as population numbers and distribution, threats, values, and causes of die-offs filled.

3.4. Tanzania Vision, Aim and Objectives:

3.4.1. Tanzania's LF SSAP Aim:

To stabilize the size and distribution of the national breeding and non-breeding LF populations at 1.5 million birds in key sites by 2020, through local national and regional action (Table 15).

3.4.2. Tanzania LF SSAP Objectives:

The aim of Tanzania SSAP is: Adoption of the International SSAP objectives (Section 3.1.3), domesticated to Tanzania conditions.

The expected outputs from the Tz LF SSAP, are

a. All key breeding and feeding sites are maintained in good ecological condition.
b. Breeding colonies are not disturbed.
c. The effects of poisoning and/or diseases, reduced.
d. Harvesting and trade in live specimens has no effect on the Lesser Flamingo populations.
e. Minimised collisions with manmade structures.
f. Minimised human disturbance at non-breeding sites.
g. Knowledge gaps filled.
h. Institutional and administration arrangements for implementation of the LF SSAP, in place.

3.4.3. Tanzania Key LF Sites:

The focus of the Tanzania LF SSAP will be on the following key sites, defined as meeting Ramsar criteria of 1% of bio-geographical population (ie + 20,000 birds), listed in 2 categories, in order of priority for the Lesser Flamingo (Table 15):

Unprotected key sites, and therefore priority for management, and associated management:

- Lake Natron (Protected by 2 WMAs, u/way) Ngorongoro & Longido DC, and Ramsar PM.
- Lake Manyara (only 50% protected by Manyara NP) Babati DC.
- Lake Eyasi Ngorongoro, Meatu and Karatu DC**.**
- Lake Burungi (67% protected inside WMA) Babati DC.
- Lake Kitangiri Meatu and Iramba DC.
- Singida Lakes Singida DC.
- Lake Balangida Lelu Hanang DC.
- Bahi Swamp Dodoma Rural and Manyoni DC.
- Lake Rukwa (Protected Rukwa-Lukwati GR) Mpanda, Chunya, Mbozi & Sumbawanga DC.

Key sites, but protected and therefore not of immediate priority, as already under some form of protected management:

- Momella Lakes (67% protected by Arusha NP).
- Lake Empakai (100% protected by NCA).
- Lake Magadi (100% protected by NCA Crater lake).
- Lake Ndutu (100% protected by Serengeti NP).

3.5. Tanzania Proposed LF SSAP Expected Outputs:

The following emerge as an adaptation of the international LF SSAP guide, domesticated to Tanzanian conditions and needs:

3.5.1. Strategic Guiding Principles:

The Tanzania LF SSAP is guided by national policies and strategies, and these are highlighted below as a strategic guide to tailor the Tanzanian actions in line with domestic initiatives, notably:

a. Integrate Lesser Flamingo into Planning: The main strategic thrust will be to mainstream the Tz LF SSAP actions into local government (ie VDP, DDP and PMO-RALG) and Community Based natural Resource Management (CBNRM), in protected area (ie through IMP, GMP, etc), at national level (through MTEF, EAP, SOER, MDA Strategic plans, etc) and regional management/development plans (through regional networks).

b. Joint Action: To network stakeholders in a synchronised, combined local and trans-boundary action, for collaboration in the conservation of the Lesser Flamingo (ie through the NWWG AEWA SC for national networking at the EA LF SSAP Regional Network).

c. Key Site Management: To take local action to identify and maintain all key sites, especially Lake Natron, by implementing community micro-projects (or Wetlands Friendly Investments = WFI) to maintain catchment and wetlands in good ecological condition, reduce the impact of catchment degradation (from irrigation, agriculture, deforestation, uncontrolled fires, overgrazing and tourism), poisoning and diseases on Lesser Flamingo populations.

d. Protect Key Sites: To extend protection (ie through declaring additional Ramsar Sites or wetlands reserves

or IBAs or WMAs) to further limit disturbances at Lake Natron, and at other key unprotected, non-breeding sites (like Manyara and Eyasi), and other known attempted breeding sites.

e. Research Key Sites: To establish research facilities and capacity, to fill knowledge gaps, on aspects of the ecology of the Lesser Flamingo (ie population numbers and distribution, threats, values, and causes of die-offs, linking breeding and feeding biology to hydro-chemistry, studying migration, doing annual census, etc), and

f. Capacity Development: To build capacity and awareness in Lesser Flamingo and instil key site management (ie local village and district authorities) by providing scientific based knowledge for informed decision making and expanding the CEPA program through a communication strategy involving schools, community leaders, district councils and senior government.

3.5.2. Tanzanian Projects and Activity Themes:

Adapting the international LF SSAP objectives to Tanzania, the Tz LF SSAP sets out to achieve the expected outputs by the following project activities. The outcomes of which are measurable by the corresponding Objectively Verifiable Indicators (OVI) set against each of the goals of the international objectives:

3.5.2.1. Objective 1: Ensure That All Key Breeding "And Feeding Sites" Are Maintained In Good Ecological Condition:

Proposed Project Themes:

a. Designate key feeding/breeding sites as protected areas.
   OVI: either, as Ramsar sites, Birdlife IBAs, WMA or World Heritage Sites.
b. Identify baseline conditions of habitat suitable for Lesser Flamingo breeding/feeding to ensure that key sites are maintained in favourable ecological status.
   OVI: either as SOER or monitoring of LF SSAP implementation.
c. Conduct strategic and project level environmental impact and audits of existing operations and future plans in catchments at all key sites, mitigate as required.
   OVI: through SEA and EIA.
d. Identify management needs of Lesser Flamingo habitat and implement necessary management actions to maintain all key sites in good ecological condition.
   OVI: through EAP, and local government DDP, or community through VDP, LUP and WMA or PA management through GMP.
e. Develop and implement integrated management (IMP) plans for the key sites and their catchment, based on LF SSAP.
   OVI: is mainstream Tz LF SSAP in catchments/coastal zone IMP and local VDP, DDP and PA GMP.
f. Maintain, or restore where necessary, favourable catchment, hydrological conditions and water quality for the species, and adaptation to climate change.
   OVI: Local communities develop alternative livelihood practices to reduce catchment pressures and direct disturbance through micro-projects or WFI, like improved irrigation efficiency, overgrazing, deforestation, agro-chemicals, sewage, agricultural encroachment, community-based eco-tourism projects, etc.
g. Raise awareness about the conservation needs of the species at national and local level.
   OVI: Communication Strategy, CEPA Program and distribute Crimson Wing in Swahili.

3.5.2.2. Objective 2: Ensure that Breeding Colonies are not Disturbed:

Proposed Project Themes:

a. Prevent disturbance (especially low flying aircraft) through research, legislation, planning, zoning, village and district by laws and through enforcement of these rules as appropriate.
   OVI: District by laws and designated no-fly zone.

3.5.2.3. Objective 3: Reduce the Effects of Poisoning and Diseases on LF Populations.

Proposed Project Themes:

a. Establish a joint, integrated flamingo health surveillance program for regular monitoring to assess the causes and effects of mass die-offs on LF in E. Africa.
   OVI: Regional Network and M&E health.

b. Raise awareness amongst community members, decision-makers, industry and other stakeholders about the risk of pollution to LF.
   OVI: CEPA material on pollutants.
c. Ensure that pollution guidelines/legislation at key sites reflect the sensitivity of the species.
   OVI: Pollution guidelines.
d. Ensure that pollution guidelines/legislation are developed and enforced, especially with reference to agro-chemicals, industrial chemicals and heavy metals.
   OVI: District by laws enforced.

3.5.2.4. Objective 4: Ensure that Harvesting and Trade in Live Specimens has no Negative Effect on The Regional Lesser Flamingo Populations.

Proposed Project Themes:
a. Maintain the existing ban on LF specimen, body parts, eggs and other trade, and do not permit an increase in the Tanzania live trade quota.
   OVI: Trade regulation and licensing.
b. Regulate and enforce strict licensing mechanisms at national level. Licensing process to be based on analysis of effect of proposed trade on regional populations, in combination with other factors.
   OVI: M&E trade losses, build capacity amongst licensed LF trappers/traders and research to improve the efficiency of survival and reduce stress on local populations.

3.5.2.5. Objective 5: Ensure Collisions with Man-Made Structures are Minimised.

Proposed Project Themes:
a. Avoid crossing important LF flyways when routing new power lines, telephone masts, telephone lines, light masts, lights, wind turbines and guide wires, new hotel developments (eg. on Empakai rim where the flamingos have certain direct routes out over lowest rim sections, after long flight up to the rim).
   OVI: Issue EIA Guidelines, and undertake Project level EIA and audit of existing and proposed operations.
b. Map flyways for use in zoning, and disseminate the information to developers, decision makers and local public.
   OVI: Flyway Maps and SEA for sensitive areas integrate into law (eg through EMA) and zoned.
c. Place streamers on existing structures in flyways to minimise collisions.
   OVI: Streamers make structures visible.

3.5.2.6. Objective 6: Ensure Human Disturbance at Non-Breeding Sites is Minimised.

Aligned with Objective 1, other Proposed Project Themes include:
a. Prevent human catchment damage and direct disturbance through legislation, planning, zoning and through enforcement of these rules.
   OVI: District by laws, zone plans, DDP, VDP.
b. Establish “code of conduct” to minimize disturbance and sensitize community, visitors and tour operators to reduce disturbance.
   OVI: Code conduct disseminated, awareness raised community engaged in participatory management of lakes.

3.5.2.7. Objective 7: Fill Knowledge Gaps

Proposed Project research themes are:

Objective 7.1. Fill Population Numbers and Distribution Knowledge Gaps.
a. Determine population sizes and trends by developing a monitoring strategy and protocols (numbers, distribution, key sites), conducting regular coordinated aerial population surveys at non-breeding sites, at least tri-annually, monitoring breeding populations and breeding success annually at all primary breeding sites, and identifying potentially unknown breeding and non-breeding sites.
   OVI: Annual and monthly census.
b. Determine population delineation and movements by conducting satellite tracking and ringing studies

to determine movements of individuals between lakes, interchange and possible gene flow between populations, site usage, and relations with food availability and quality.
OVI: Tracking monitoring and satellite history documented.

c. Establish a health surveillance strategy and conduct an integrated flamingo health surveillance programme to assess the causes and effect of mass die-offs on Lesser Flamingo populations.
OVI: Health M&E.

d. Establish database on trade mortality, in capture areas and during holding or transportation.
OVI: Trade Database.

Objective 7.2. Fill Demographic Knowledge Gaps.

a. Systematically collect data on breeding success and recruitment, including factors influencing fluctuations in breeding populations, frequency of breeding by individuals, age of first breeding, reasons for breeding failure, the role of practice nest building, survival rates, population structure, plumage development, moult strategy (timing and location), relationship between nuptial display and start of breeding.
OVI: Breeding M&E and the triggers.

Objective 7.3. Fill Habitat Requirement and Behaviour Knowledge Gaps.

a. Systematically collect data on breeding behaviour and habitat requirements, including the role of rainfall in determining breeding success.
OVI: Hydro-chemistry and breeding study.

b. Systematically collect data on feeding behaviour and habitat requirements, including daily food requirements, food quality at key sites, carrying capacity of key sites, differences in freshwater and food requirements.
OVI: Fledging and adult feeding study.

c. Understanding catchment processes, ecosystems services, hydro-chemistry and primary productivity links.
OVI: Catchment and trans-boundary hydro-logical study.

Objective 7.4. Fill Disease, and Poison Threat Knowledge Gaps.

a. Systematically collect data on the role of diseases and poisons in population regulation, including the effects of infectious and non-infectious diseases.
OVI: Toxicology study.

b. Model long-term effects of climate change and diseases.
OVI: Climate change study.

c. Evaluate the relative importance of different threats.
OVI: Success, weakness, opportunity and threats study.

Objective 7.5. Fill Genetics Knowledge Gaps.

a. Systematically collect data on the genetic relatedness within regional populations and genetic exchange between regional populations in order to detect genetic bottlenecks which might be dangerous for this species.
OVI: Genetic research.

Objective 7.6. Fill Lesser Flamingo Value Knowledge Gaps.

a. Understand the cultural importance of LF.
OVI: Socio-economic Study.

b. Calculate the economic value of LF (Social, Economic, Environmental, and Cultural) to national and local community.
OVI: Tourism values estimated and Natron economic assessment study.

Objective 7.7. Fill Operational Knowledge Gaps.

a. Assemble a LF bibliography (See Annex 5).

OVI: Bibliography.

b. Assemble a database and make operational through DeNRM Basket Fund.
OVI: LF Trust Fund listing funding sources and information linked to DeNRM Basket Fund).

3.5.2.8. Objective 8. General Institutional and Administration Arrangements for Implementation of the LF SSAP, in Place.

a. Establish and make operational a National and Multi-institutional Eastern Africa Regional Coordination Body for the Implementation of the LF SSAP (Annex 1).
OVI: A National Coordination Body for the LF SSAP (the AEWA SC under NWWG) and a EA Regional LF Network.

b. Establish and make operational key site offices and research base.
OVI: Lake Natron Ramsar Site Office, Makat Research Centre established, staffed, operational and doing research.

4.0. Action Plan for Tanzania Lesser Flamingo

The detailed action plan is attached as Table 15. This can be tailored to MTEF or GMP format for mainstreaming in local GMP and DDP action planning processes.

Project	Overall priority	Agency responsible	Cost- $$	Time Scale	Expected Outputs	Indicators	Completion date?	Risks and opportunity	Remarks

5.0. Monitoring And Evaluation (M&E) Plan

The M&E plan for this Lesser Flamingo Action Plan will be done at projects, objectives and aim levels with the national coordinating office (the NWWG AEWA SC) and the lead agencies, with assistance from other stakeholders. The Wildlife Department (WD) shall be the lead agency and the Wetlands Unit (WU) shall be the Action Plan implementation Secretariat, and TAWIRI, as the Chair of the NWWG AEWA SC, supporting the NWWG and guiding research, with participation from all NAWESCO stakeholders.

The projects table with specific and measurable indicators will be used for M&E (Table 16) and, evaluations shall be done annually, reporting to NWWG and NAWESCO, and to Ramsar and AEWA as per convention obligations.

Table 16: M&E of Lesser Flamingo SSAP.

Project	Agency responsible	Cost- $$ Expenditure vs budget	Time Scale Achievement vs time plan	Expected Outputs Achieved as per time plan	Indicators OVI that have been achieved vs plan	Comment on Progress	Risks and opportunity	Remarks and lessons learnt, follow-up action

6.0. Resource Mobilization And Implementation Strategy

The resource mobilization and implementation strategy for this LF Action Plan should be broad based to address the regional challenges affecting the entire Lesser Flamingo population in East Africa. The NWWG AEWA Sub-committee shall be the national planning and coordination committee comprising experts and representatives

from key sectors. They will spearhead and lead the implementation process, advising the main NWWG, and guiding the IMP of Natron, as the next stage of events.

This specialised sub-committee will operate under the auspices of WU/WD, which, as the Ramsar Secretariat, is the overall responsible for oversight of the implementation of the LF SSAP. One of the key mandates of the coordination committee (ie NWWG AEWA SC) will be to develop a resource mobilization strategy, establish the LF Trust Fund and to help raise financial and technical resources locally and internationally. Specific institutions to be approached for support will include relevant government ministries, NGO, civil society groups, members of the private sector, international organization partners, bilateral and multilateral development partners and the relevant environmental agencies and university colleges. A specific resource mobilization strategy will be developed and used to raise resources locally and internationally.

Capacity building through training, education, awareness and advocacy programmes will be continuous for winning political and public support for the programme. Lesser Flamingo range states in East Africa will be equally sensitized and mobilized to participate and contribute to the implementation through the EA LF SSAP Regional Network.

ANNEXES

Tanzania National Single Species Action Plan 2010-2020 for the Conservation of the Lesser Flamingo (Phoeniconaias minor)

Annex 1:	*Regional Network: Implementation of the Single Species Action Plan for the Conservation of the Lesser Flamingo and its Shared East African Regional Ecosystem for the Improvement of Local Livelihoods.*
Annex 2:	*List of Potential Threats to Lesser Flamingo in Tanzania.*
Annex 3:	*Global Threats To Lesser Flamingo Using Problem Tree Analysis.*
Annex 4:	*Applied Research Action Plan for the Survival of the Lesser Flamingo in Lake Natron"*
Annex 5:	*Lesser Flamingo Bibliography and Reference List.*

Annex 1:

"Regional Network"

Implementation of the Single Species Action Plan for the Conservation of the Lesser Flamingo and its Shared East African Regional Ecosystem for the Improvement of Local Livelihoods: 2010-2015.

"The original was submitted to RAMSAR Secretariat at COP 10, 2008in regional initiative format, but was not funded and has been modified to serve as a framework for future development of regional cooperation to manage a shared stock".

Aim of the regional initiative

1. Implementation of the Ramsar Approach

1.1 Describe briefly how your initiative is promoting the objectives of the Convention and how it is implementing the Ramsar Strategic Plan through cooperation in your region:

This initiative centers around Lake Natron as the single most, globally important, breeding site for 60-70% of the world's population of Lesser Flamingo. It adopts a trans-boundary, regional and shared wetland ecosystem approach to the management and wise use of the species, its flyways, habitats, breeding grounds and economic benefits. The aim is to establish a Regional Network to manage the interconnectivity of the population, to ensure sustainability of its shared ecosystem services and trans-boundary economic significance both to the local livelihoods and to the regional eco-tourism trade.

In so doing, the initiative meets several of the COP9 operative objectives, notably:

- OO1.2: Regional monitoring of wise use of wetland resources and species;
- OO2.1/2: Alignment of trans-boundary policies and initiatives;
- OO3.1/2: Dissemination of regional best practices;
- OO3.3: Establishes regional significance of resource to national economies and local livelihoods;
- OO3.4: Integration of territorial management from regional level to grassroots village planning;
- OO6.1: Active involvement of informed local communities to benefit from related eco-tourism;
- OO7.1: Active involvement of private sector and local community as economic partnerships;
- OO8.1: Establishment of tax-based economies of user pays systems, for future self-financing;
- OO9.1: Development of a regional CEPA on wise use of the Lesser Flamingo and its shared habitats;
- OO10.1/2: In the process, identify potential new sites that need listing as wetlands of importance;
- OO11.1/2: Instill local action and implementation, to maintain and monitor site ecological characters;
- OO12.1/2: Promote cooperation in shared flyway and basin monitoring and management;
- OO13.1: Establish an international and regional network of cooperating partners and vested parties.
- OO14.1: Share information on management and economic values of a shared species.
- OO15.2: Ensure environmental safeguards in ecotourism and other investments in the species habitats.
- OO16.1: Pool resources, research and projects in collaborating in a shared resource management.
- OO18.1: Promote cooperation between parties who share this common resource.
- OO19.1: Regional and international networking, lobby for global support to manage a shared resource.

Substantive elements of the regional initiative

2. Complete Regional Adherence And Bottom-Up Approach

2.1 Describe Briefly If Your Initiative Is Based On A Bottom-Up Approach:

During the recent global interest surge, spurred by a possible mining threat to Lake Natron's key breeding population, international, regional, national and local pressures were rallied. Regional consultations, by the Birdlife network, right down to the grass-roots level, received support to lobby for the protection of the Lesser Flamingo, and Lake Natron. This initiative builds on this momentum. It is about maximizing livelihood benefits

to communities who live and share the same ecosystem services as the Lesser Flamingo. “If it pays it stays!” If communities see benefits, they will protect the resource. The focus is to instill wise use through Community Based Natural Resource Management (CBNRM) in people who live with Flamingos, who’s livelihoods are intertwined, who survive by sharing the same critical ecosystems services and to raise benefit sharing to these communities through eco-tourism and related ventures.

2.2 List The Countries In The Region That Your Initiative Covers:

The initiative will cover most of the “primary range states” who share the same East African Lesser Flamingo sub-population, flyway, feeding and breeding grounds and habitat, all interconnected by Lake Natron as the only common breeding area. Partners are therefore linked to the ecological survival and breeding success of the species, and collectively, share its economic importance to local livelihoods and national tourism economies. Notably, the Network is first and foremost those immediate 4 states that share the East African Lesser Flamingo population:

- Tanzania, Kenya, Ethiopia and Uganda.

Information linkages will however be maintained with other Lesser Flamingo key sites, notably:

- Botswana, Namibia, Guinea, Mauritania, Senegal, India, Zambia and South Africa.

2.3 Specify Those Countries In Your Region That Do Not Participate In The Initiative (If Any):

The network is based on the 4 key East African countries who share the same Lesser Flamingo population, primarily linked to the Lake Natron breeding population. Proposed is to maintain information linkages with other African countries that have a Lesser Flamingo population, but which may not be dependent on Lake Natron.

3. Active Involvement Of All Relevant Stakeholders

3.1 List The Participants In Your Initiative And Their Affiliation:

The international support that mobilized the global “Think Pink Campaign”, are key partners, notably: the Ramsar Secretariat, IUCN, AEWA, UNEP, Birdlife International, RSBP, CMS, WWF, Flamingo SSC, Wetlands International (WI), Disneynature (DN), etc.. The above, together with the Tanzanian, Ugandan, Ethiopian and Kenyan counterparts (ie. Tanzania = MNRT/WD and NWWG; Uganda = the National Wetlands Program; and Kenya = the Wetlands Program, Kenya Wildlife Services and National Environmental Management Agency) took part in a February 2008 Ramsar Appraisal Mission of the threats to Lake Natron, and they gave birth to the idea of this collective, East African initiative.

Through Ramsar and Birdlife International regional networks, contracting parties in Botswana, Namibia, Ethiopia, Guinea, Mauritania, Senegal and South Africa were sensitized to the threat.

In addition, Birdlife International has mobilized support from some NGOs in 24 affiliated countries. Likewise, local and regional NGO and private sector support, as partners, were rallied through the networks of the 50 NGOs affiliated to the Lake Natron Consultative Group (Kenya), and those of the Tanzania Bird Atlas Project (TBAP), WCST and TNRF.
The Donor Working Group on Environment (DPG-E) Tanzania (representing Danida, NORAD, Finnida, Sida, EU, USAID, Belgium Cooperation (BTC), UNDP/UNEP, FAO, World Bank, etc) had collectively indicated they are willing to support Tanzania in undertaking the Lake Natron mining EIA. In addition, Danida currently supports a Sustainable Wetlands Management Program (SWMP) in Tanzania, involving the WD and includes support to Lake Natron, its IMP, WMA and districts. This support will run until 2013. AWF has also started a WMA project for Natron under USAID funding, and Birdlife International likewise is supporting the IMP through a Jensen Foundation fund. Leicester University and affiliates currently run a “virtual school”, conducting expeditions to study Natron, and raise funds for further research. Through the DPG-E Tanzania, donors could be used to network interest in donor agencies in partner countries.

3.2 Indicate If Only Ramsar Administrative Authorities At National Level Or Also Other Relevant Stakeholders (Including Other Ministries, Intergovernmental Bodies, Ngos, Academia And Economic Actors) Are Actively Involved:

The network will work through state actors, mainly the Ramsar Contracting Parties, notably, the Wildlife Authorities in the partner countries. Equally, the network will link with Local Government Authorities as grass-root implementation will be through decentralized, administrative processes (= DeNRM). The on-the ground activities with communities will also involve local NGOs working in the area (eg. For Natron: IPI, UCRT, SCF, WCS, FCF, OXFAM, CORDS, Ujama, AWF, TNRF, WCST, Birdlife, etc) and local private sector tour operators (eg. For Natron: WWG, TGT, Ngaresero Camp, Ngarosero lodge, etc), investors and other user groups (eg irrigation projects by OXFAM, etc), and donors (eg Danida, Jensen Foundation, USIAD, etc).

4. Development Of Collaboration Based On Commonly Agreed Terms

4.1 Describe Briefly How Your Regional Network Or Centre Is Operating (Attach The Terms Of Reference (Or Other Agreements) Elaborated To Guide Its Activities As Separate Documents Where They Exist):

The concept of the East Africa Regional Lesser Flamingo Network is only recently introduced, and with support from Ramsar, intends to build up wider capacity and support, for this initiative. Draft TORs for the Network, are attached. The concept is one of regional cooperation, information sharing, synchronizing research, sharing efforts to attain a better understand and establishing a joint management institution of a shared, migrant economic resource.

Through a Lesser Flamingo webpage, and e-mail group, information sharing will take place, swapping best practices, lessons learnt and scientific knowledge. North to South scientific support will be coordinated and projects pooled for a consolidated implementation of the IUCN/AEWA Lesser Flamingo Single Species Action Plan (SSAP). Collectively, the Network will link local and country fora into a regional network. The Network will primarily be an e-mail group, for wider information sharing. The Network, may join forces, when needed to provide support for a joint funding proposal (eg from Ramsar), otherwise, in its own right, each country will fund and manage its own events, always in liaison with others.

5. Involvement Of Other Regional Partners

5.1 List Relevant Intergovernmental Or International Organizations Operating In Your Region:

As mentioned above, the following have been involved: Ramsar Secretariat, IUCN, AEWA, Birdlife International, RSBP, CMS, WWF, Flamingo SSC, Wetlands International, UNEP, TRAFFIC, WCS, etc.

5.2 List Those With Which You Have Established Common Activities:

All of the above.

5.3 List Your Activities In Common:

- A global concern to save the Lake Natron Lesser Flamingo from mining (and other) threats.
- A common agreement to ensure local communities and Lesser Flamingo live in harmony and sustainably through ‘wise use” of the key lake’s ecosystem services.
- Common agreement to implement the IUCN/AEWA/CMS Single Species Action Plan (SSAP).
- An interest to prove the “long term (ie million years of tourism)” economic worth of the Lesser Flamingo outweighs any “short term (ie. 100 years of mining)” consumptive resource use”.
- A common research interest to better understand the biology of the Lake Natron and EAC Lesser Flamingo, its habitats and its genetic relationship and survival linkages to other African populations.

6. Scientific and technical backing

6.1 List The Scientific And Technical Partners That Provide A Solid Backing To Your Initiative:

- International: Ramsar Mission, IUCN, AEWA, Birdlife International, RSBP, CMS, WWF, Flamingo SSC, UNEP, WCS and Wetlands International.

- Research partners: Max Plank Institute, Wildlife Conservation Society (WCS), Leicester University, etc.
- Local Research Institutions: TAWIRI, USDM, IRA, SUA, etc.
- Local: Tanzania DPG-E, Danida, Sand County Foundation, WCST, TNRF, Tanzania Bird Atlas Project, IPI, CORDS, Ujama, etc.

7. Targets Of The Initiative And Their Links With Ramsar

7.1 List Your Initiative's Strategic And Operational Targets For The Period 2009-2011:

a. By 2010 to have established a global and regional electronic network and web page for Lesser Flamingo.
b. By 2010 to start implementation of the Lesser Flamingo SSAP as mainstreamed into the District Development Plans around key shared habitats in partner countries (especially Lake Natron).
c. By 2011 to have estimated the regional worth of the Lesser Flamingo to local livelihoods and eco-tourism.
d. By 2013, through regional satellite telemetry and genetic DNA, carry out an analysis of the migration patterns and inter-dependence, of the Lesser Flamingo. Establish the global; importance of Lake Natron to the survival of the East Africa regional and Southern Africa populations.
e. By 2014, through research on the feeding and breeding biology, establish the relationship of the species survival to the plankton biology and related water chemistry and hydrology (especially of select key sites, like Lake Natron). Develop a management model that factors in the threats of climate change and wise use of shared ecosystem services.

7.2 Specify The Relations Of These Targets To The Objectives Of The Draft Ramsar Strategic Plan (Attach Your Work Plan For 2009-2011, Or For 2009, Where It Exists):

These targets aim to support and implement the SSAP of the Lesser Flamingo, but more specifically, are focused on justifying its conservation by establishing its importance and that of catchment management to local livelihoods and regional tourism economies, today and in the future. In this regard it supports the 2009-2014 Ramsar Strategic Plan by networking, to look at the inventory of collective value and alternative economic developments, and to halt any further potential degradation of shared ecosystems services. It is based on a shared management approach to the ecosystem of the East African Lesser Flamingo. It looks at values of the Lesser Flamingo and its wetlands services to people living with them and to eco-tourism and other livelihood uses, to network, to share, to synchronize wise use best practices and to harmonize actions at regional, national, local, community level and private sector.

The millennium ecosystem assessments will be applied as a tool to monitor wise use guidelines and water management, accommodating for the threats of climate change and of growing population pressures changing land use priorities, to accommodate poverty. Regional institutional capacity will be strengthened and through the East African Shared Waterbody Protocols, unify policy and regulations across regional boundaries to combine forces in a more united effort based on a EAC Regional Integrated Management Plan for the Lesser Flamingo.

Draft proposed Work Plan and Budget is available.

8. Raising Awareness Of Ramsar Objectives

8.1 Describe Briefly Your Activities In The Fields Of Communication, Education, And Participatory Processes With Relevant Stakeholders:

The network as such, will become a means of information sharing through its webpage and e-group. In addition, as the key focus is to measure the livelihood and economic worth, local communities and investors will participate. Overall, the aim, once the tourism values are known, once the knowledge on breeding biology improves, is to package these into awareness and training materials and CEPA tools for use both at community and training institution level, as tools for decentralized planning and decision making.

8.2 Describe Briefly The Increased Support For Ramsar Objectives Resulting From These Activities (This Information May Be Used By Ramsar's CEPA Oversight Panel, According To Standing Committee Decision 35-14):

The initiative will strive to show that through regional mobilization for a shared resource like the Lesser Flamingo, it is not enough to protect one site of importance, but also the need to cooperate to manage other, interlinked ecosystems, internally and trans-boundary. In addition, the regional cost-benefit analysis will show that threats to the species in one site, could have far reaching economic and conservation consequences, in another. And, if the resource can benefit livelihoods, wise use principles and value added tourism, can ensure the emergence of a "tax-based economy" to contribute to local poverty reduction.

Financial and other support for the regional initiative

9. Who Provides Political And Financial Support?

9.1 List All Your Sources And The Amounts Of Financial Support For The Triennium 2009-2011. Specify The Amounts Which Are Already Confirmed:

- Danida: USD 475 000 for 2008-2013 for Lake Natron Ramsar Site Office and implement IMP (confirmed).
- GEF: 2*USD 40 000 for each district local action (to be applied for).
- Ngaresero Tour Operators: USD 40 000/year concession fee to local development (Lake Natron) (u/way).
- Ngorongoro District: USD 60 000/year in gate fees sharing for local development (Lake Natron) (u/way).
- Longido District: USD ##/year in gate fees sharing for local development (Lake Natron) (u/way).
- Friedkin Conservation Fund: USD 2 000/village * 24 for local development (Lake Natron)(underway).
- Sand County Foundation: USD # 000 for land use planning East Bank Lake Natron (underway).
- Oxfam: USD # 000 for sustainable irrigation in Pinyini River, Lake Natron Catchment (underway).
- Birdlife/RSBP: USD # 000 support to Lake Natron Consultative Group/WSCT (underway).
- Birdlife/Jensen: EU 300 000 support to Lake Natron IMP implementation (underway)
- Global Flamingo Movement Forum: World Flamingo Tracking Project (under preparation).
- Private Investor: USD 1.5-1.8 million in eco-tourism around Lake Natron (under consideration).
- UNEP (Kenya): National Lesser Flamingo Conservation Action Plan (under preparation).
- Wildfowl and Wetlands Trust: Surveillance, migration, climate change, cultural threats and economic values (under preparation).
- SWM-AEWA/CMS: Lesser Flamingo SSAP (completed).
- Max Plank Institute: Ringing study (under preparation).
- IUCN: Integrated resource assessment study, Lake Natron (in preparation).
- AWF: SCALE project to support Longido WMA (funded).
- WCS: Support to PhD studies at Natron (under preparation).
- Leicester University (and affiliates): Bi-annual expeditions to Lake Natron (underway).
- Leicester University (and affiliates): Research program for Lake natron hydro-logy (under preparation).
- Leicester University (and affiliates): 2 PhD studies E Africa soda lakes (underway).

9.2 List Your Sources And Amounts Of Financial Support For The Year 2009/10. Specify The Amounts Which Are Already Confirmed:

- Danida: USD 200 000 for Lake Natron Ramsar Site Office and start the IMP.
- Ngaresero Tour Operators: USD 40 000 concession fee for local development (Lake Natron).
- Ngorongoro District: USD 60 000/year in gate fees sharing for local development (Lake Natron).
- Friedkin Conservation Fund: USD 2 000/village for local development (Lake Natron).
- Sand County Foundation: USD # 000 for land use planning East Bank, Lake Natron.
- Oxfam: USD # 000 for sustainable irrigation in Lake Natron Catchment.
- Birdlife/RSBP: USD # 000 support to Lake Natron Consultative Group/WSCT.

9.3 List concisely, according to main budget lines, your expenditures planned for 2009/10:

See separate Work Plan and Budget.

10. Financial Planning

10.1 Summarize Your Remaining Funding Needs For 2009/10 That Are Not Yet Covered By Confirmed

Donations, According To The Main Budget Lines Used Above:

According to budget estimates, the Regional Initiative will have a shortfall of USD 200 000 in 2009/10.

10.2 Provide Information About Your Fundraising Plan To Cover Such Outstanding Needs:

The network of partners, is currently coordinating the preparation of the following fund applications:

- GEF: 2*USD 40 000 for local action (to be applied for).
- Birdlife: Natron Consultative Group (Kenya) plan to undertake an economic analysis.

11. Request For Ramsar Core Budget Support

11.1 If You Request A Financial Contribution From The Ramsar Core Budget, Specify The Amount For 2009, And For The Triennium 2009-2011:

The Regional Initiative would need core support for the Secretariat's Coordination Office, its operations, webpage hosting, technical support (ie bird counts, ringing operations, DNA study, etc) and annual workshops amounting to USD 200 000 in 2009, and USD 350 000 from 2009-11.

Governance of the regional initiative

12. Governance Mechanisms In Place

12.1 Describe The Governance And Advisory Mechanisms And Structures (E.G., Committees) In Place Or To Be Established To Provide Guidance And Insight To Your Initiative (Attach Terms Of References, Rules Of Procedures, Or Operational Guidelines, Where Such Exist):

In the first instance, the MNRT (Tanzania) as lead partner, together with lead countries Kenya, Ethiopia and Uganda will constitute an East Africa Regional Lesser Flamingo Network Committee. Each partner will have a designated focal point for internal communication, liaison and coordination (In Tanzania, this will be the AEWA Thematic Group of the NWWG). Through established networks, the Committee will widen the circle to other countries that share the common global resource and SSAP (Botswana, Namibia, India, Guinea, Mauritania, Senegal and South Africa) and international partners (Ramsar, Birdlife International, IUCN, SSC, CMS and AEWA). Tanzania in the first instance will Chair the Network, and provide technical and secretarial support from Danida support and Technical Assistance to the Wetlands Unit, in the Wildlife Division. Proposed is to rotate this every 3 years. See Terms of Reference attached.

13. Coordination With The Ramsar Secretariat

13.1 Specify The Established Or Anticipated Operational Arrangements Between The Governance Structures Of Your Initiative And The Ramsar Secretariat:

The East Africa Lesser Flamingo Network focal points in partner countries, will as part of their reporting obligations keep the Ramsar Secretariat and Regional Chairman informed of individual country progress against the SSAP. Tanzania, as the first coordinator of the network will consolidate this information and through the SSC, report on regional progress.

13.2 List The Full Name, Telephone And E-Mail Contact Of The Main Focal Point Of Your Initiative:

Full name: PS, MNRT or Director, Wildlife Division, Tanzania, Attention: Wetlands Coordinator
Telephone: 255-222111063 or 255-754261501.
E-mail: director@wildlife.go.tz

14. Draft Terms of Reference for a Regional Lesser Flamingo Network

Title:
Network for the Implementation of the SSAP for the Conservation of the Lesser Flamingo.

Key Partners:
1. Tanzania (lead partner)
2. Kenya
3. Uganda
4. Ethiopia

Information Sharing Network:

Partner Countries: Botswana, Namibia, India, Guinea, India, Mauritania, Senegal and South Africa.
International Representatives: Ramsar, Birdlife International, IUCN, SSC, CMS and AEWA.

Objectives:

Cooperation between East African regional countries with key sites, to synchronize efforts to implement the Lesser Flamingo SSAP, to develop local livelihoods through eco-tourism.

Terms of Reference:

The Regional Network shall be catalytic to:
a. Establish unity, through an East Africa Regional Forum of country networks that share a common interest in the conservation of the Lesser Flamingo and who are dedicated to implement the SSAP.
b. Each member shall ensure that the International Lesser Flamingo SSAP is incorporated into national and local government development plans for key sites.
c. Shall maintain a local e-mail group and Lesser Flamingo Webpage, to maintain liaison, communication, information sharing and synchronization of conservation efforts.
d. Shall exchange information, lessons learnt, best practices, research experience and any other useful communications.
e. Shall coordinate and cooperate in research, in particular in a regional flyway and shared resource assessment of the genetic linkages of the population to key breeding sites.
f. Shall cooperate to establish the net economic worth of the Lesser Flamingo to tourism and livelihoods, develop and implement a Regional East Africa Lesser Flamingo Integrated Management Plans at key sites to maximize on the global tourism potential, instilling an equitable benefit sharing with communities that live with Flamingos.
g. Shall, wherever possible, instill CBNRM through decentralized local government channels so that communities living with Lesser Flamingos are assisted and benefit.

Procedures and Operational Guidelines:

a. The East Africa Network shall initially be hosted by Tanzania, but every 3 years, the lead partner may change based on a common vote.
b. Each member country shall nominate a Network Focal Point, responsible to its country members.
c. Each member state shall operate in its own right, be autonomous in raising and accounting for funds for national projects. However, regional cooperation is expected for regional fund raising, where each partner will have one vote say in the regional funding, and accountability.
d. The Country Focal Point shall endeavour once a year to come together, to examine progress, review the common work plan and agree on key regional activities for the next period.

15. Regional EAC LF SSAP Plan and Budget 2009-11:

(See attached budget)

Annex 2:

List of Potential Threats to Lesser Flamingo in Tanzania

(An abstract from the International SSAP, modified to Tanzania)

1.0 Disturbance of Habitats

1.1. Habitat Loss and/or Degradation **Importance: Critical**

The Lesser Flamingo is highly specialized. Its diet is limited to microscopic cyanobacteria and benthic diatoms that occur only in saline/alkaline lakes. Because it is adapted to respond to changes in environmental conditions by moving among sites regularly, it is dependent on a network of such sites, which for the East Africa population is spread over 4 countries. Due to their itinerant nature Lesser Flamingo conservation needs to be based on a process that takes into account the entire sub-regional population. Trans-boundary and catchment-based and shared ecosystems services conservation strategies are equally important given the ecological linkages between the lakes and their watersheds. Activities in the catchments disrupt the ecological integrity of the lakes and their suitability as flamingo habitats. Most fluctuations in the flamingo numbers are caused or catalyzed by ecological and catchment processes and the effects of climatic and hydrological trends in the region. These changes have been aggravated by unsustainable land use, economic and development practices within the watersheds affecting water cycles and compromising ecosystem services.

1.2. Effects of Altered Hydrology **Importance: Critical**

The Lesser Flamingo is sensitive to changes in water levels and quality. Cyanobacteria, its primary food, require a certain range of salinity to reproduce in sufficient quantities to feed large numbers of Lesser Flamingos. Changes in the abundance of cyanobacteria can have a substantial effect on the Lesser Flamingo population at a site.

Rainfall and water levels are also critical to successful breeding. If the level is too high, the birds are unable to build their nests. If it is too low, terrestrial predators are able to reach and destroy the nests. If the water level drops prematurely after the eggs are laid, but before the chicks are ambulatory, terrestrial predators are able to reach the colony and destroy the breeding attempt by feeding on the eggs and chicks. This may be relevant to the Ngarosero, Pinini and Ewaso-Nyiro (In Kenya) Rivers, important sources of water for Lake Natron. Activities that alter the flow of these river would affect the hydrology of Lake Natron, hence affecting the breeding cycle of Lesser Flamingos.

Changes in water and salinity levels can occur either from natural or man-made causes. Natural causes include flooding due to heavy rainfall and evaporation due to prolonged drought. Man-made causes include increased flooding, sedimentation and climate change. These occur due to burning, deforestation, over-grazing or an increase in arable farming on steep slopes all leading to erosion and increased run-off in the catchment. Reduced inflows and water levels also occur due to drainage of land for agriculture, infrastructure, creation of dams and reservoirs, canalisation of rivers, diversion of rivers, abstraction from feeder streams and rivers for irrigation, drinking water, reforestation, industry, hydro-power generation or mining (eg soda brine extraction).

1.3. Wetland Pollution **Importance: Medium**

Pollution is considered a probable catalytic agent to flamingo mortality within the region (notably Kenya). Pollution is mainly from agricultural, industrial and domestic pollutants in the form of fertilizers, heavy metals, pesticides and high nutrient loads that lead to the formation of toxic algal blooms. Due to the nature of alkaline lakes (shallow and relatively small), they are quickly influenced by the anthropogenic processes within the catchment basins. Drying up can concentrate these toxins that accumulate in the lakes.

In Kenya, Lake Nakuru has several agricultural farms and industries (for agricultural produce, tanneries, oil depots, etc), a prolific producer of solid, industrial and domestic effluents that finally end in Lake Nakuru. Likewise, Lake Elementeita (the diatomite-mining factory, and timber treatment plant and small scale agriculture and

settlements) also has potential sources of pollution. In Lake Bogoria (agricultural activities are contributing a lot of agro-chemicals) there are increasing contamination risks of pollution. Lake Manyara reports deaths of 15 - 43 000 in August 2004 (Kihwele, 2009). These deaths could be due to local causes, or, given the itinerant nature of the bird, arising from poisoning or stress elsewhere (eg Kenya lakes).

Deaths suspected from pollution of flamingo lakes (in the region) has therefore increased with increase in human populations in the catchments. Heavy metals originating from local industries and excess nutrients from agricultural and domestic effluents from the surrounding farmlands have found their way into the lakes. This has also resulted in lake eutrophication leading to frequent algal blooms and possibilities of Lesser Flamingo mortality and sub-lethal stress arising from intoxication.

The principal actors on the sources of pollution are excessive agricultural development in catchment, unplanned urban and industrial developments and ineffective compliance with EIAs and Environmental Audit procedures. The management of both liquid and solid waste (ie sewage) in these areas is equally wanting and research to identify and develop environmental management strategies that will help mitigate effects caused by industrial and storm water pollution, is necessary.

1.4. Extraction Of Salt And Soda Ash **Importance: Critical**

Lake Natron is one of the saline lakes where salt has been traditionally harvested for small scale, mainly domestic purposes as livestock salt lick. This has been considered to play a low significance or threat to Lesser Flamingos as the species has lived with this for centuries. However, large scale, commercial harvesting as proposed for Lake Natron, learning from Lake Magadi (in Kenya) where this has been going on for several decades, has affected the hydrology of the lake, and although still heavily utilized by Lesser Flamingos, breeding has believed to have stopped (ie. Breeding at Magadi has been recorded only once in the past century), allegedly due to the disturbances. Mining is considered an important threat to the Lesser Flamingo breeding habitat of Lake Natron in as much as it will affect the water-balance.

1.5. Disturbance Of Non-Breeding Populations By Human Activities **Importance: low**

Disturbance at those sites where sources of fresh water are limited prevents the birds from getting to fresh water for drinking, bathing and early feeding on the organic muds in the mud-flats. This could have serious implications for the birds on a local basis in the short term.

1.6. Disturbance by Human Settlements **Importance: local**

Human settlements including tourism developments and hotels, near flamingo sites could potentially stress breeding and non-breeding birds. In Lake Elementeita, continuous land subdivisions and increased settlements have resulted in a portion of the lake being abandoned by the Lesser Flamingos. Low flying aircraft and hot air balloons in Lakes Elementeita and Nakuru could also be a source of disturbance. Photographers approaching nests have lead to subsequent abandonment. Recent fly-over photography over Lake Natron, was reported to lead to a mass migration of birds leaving the lake (Andersen, pers comm). With an increase in the frequency of these activities it is expected that it will cause some impact to the populations.

2.0 Poisoning **Importance: High**

Direct and indirect poisoning of Lesser Flamingos through the introduction of heavy metals, agrochemicals, domestic waste and industrial chemicals into the areas where they feed, or through cyanobacterial toxins may be the cause of reported large scale illness and death. Large-scale die-offs, each involving tens of thousands of Lesser Flamingos have been attributed to ingestion of heavy metals, pesticides and cyanobacterial toxins, on feeding lakes in Kenya (Bogoria and Naivasha) and Tanzania (Manyara).

In Lake Bogoria, the ingestion of toxic cyanobacteria (Synechococcus bigranulatus, Spirulina subsalsa, Phormidium terebriformis, Oscillatoria willei) from the hot spring-mats are thought to have contributed

to the mass mortalities. This was supported by high concentrations of the cyanobacterial hepatoxins (microcystins) and neurotoxins (anatoxin-a) in dead flamingo stomach contents and fecal pellets. Neurological signs of cyanotoxin poisoning of the birds have also been observed. This could result from accidental feeding on the mats that breakaway from the hot springs. Lesser Flamingos mortalities also revealed traces of heavy metals including zinc, copper, lead, mercury and cadmium. The cause of death could have been heavy metals acting alone or in synergy with other stress factors such as the cyano-toxins, heavy metals, pesticides or opportunistic diseases, and could be compounded by stress after a long flight between lakes.

3.0 Infectious Diseases — Importance: High

Infectious diseases may have played a role in the die-offs that have occurred in Kenya in the past decade (1993, 1995, 2000, 2002, 2006) and more recently in Tanzania (2004), and seem likely to threaten the flamingo populations of East Africa (Manyibe et al. 2007; Kilewo and Mlengeya 2004; Lugomela et al. 2006). Diseases such as avian flu, avian TB, avian cholera, botulism, salmonella and pseudomonas have been singled out as having contributed to the deaths in the mass die-offs recorded during the past 30 years. Records of deaths in Kenya (since 1970) include: mycobacteriosis (tuberculosis), avian cholera (pasteurellosis) and parasitic diseases.

4.0 Predation — Importance: Local

Baboons, African Fish Eagles, Steppe Eagles, Marabou Storks, vultures, feral dogs, jackals and hyenas do predate on sick adult and juvenile flamingos, and eggs. Predation can be a serious problem at breeding sites, particularly when the water level has receded allowing access by terrestrial predators. Marabous are believed to wreck havoc at Lake Natron (Aberhard, per obs).

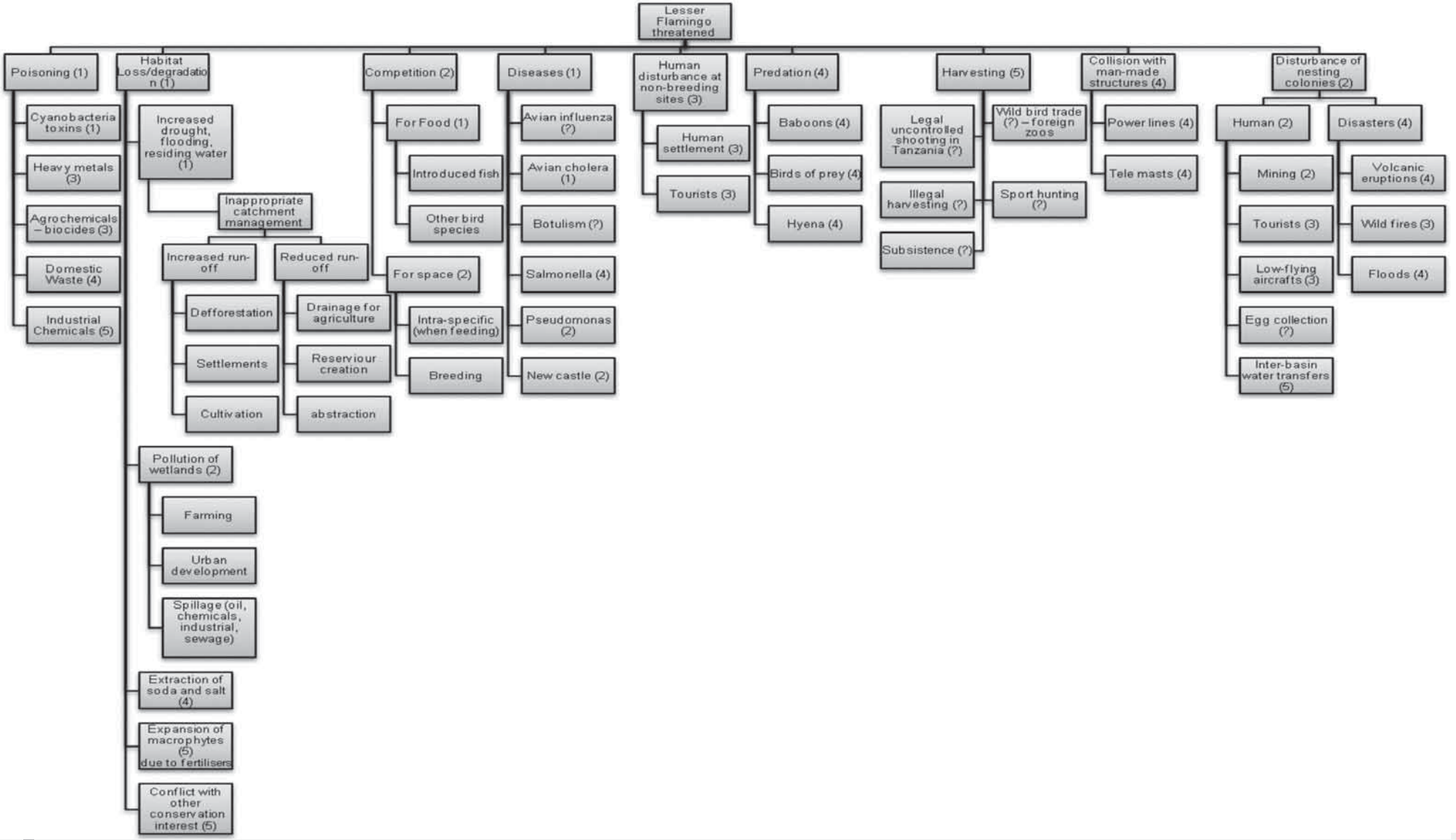
5.0 Competition — Importance: Local

The main species that would compete with flamingos for food is the algae-eating fish and crustaceans Artemia brine shrimp. The later is common where salt extraction is taking place where it is introduced into the solar evaporation ponds of salt factories, to eat the algae. Many gaps however still exist concerning the level of competition with other avian species for space and breeding sites. The Lesser Flamingos tends to prefer isolated, flooded breeding sites, which do not seem suitable for other species, except Greater Flamingo, but no inter-species competition has been reported. In Natron, the fish of the Alcolapia group thrive in the springs and lagoons, could also compete for plankton as food.

Annex 3:

Global Threats To Lesser Flamingo Using Problem Tree Analysis

(Abstracted From Kenya, SSAP as a basis to harmonize SSAP of a shared population)



Annex 4:

Applied Research Action Plan for The Survival of the Lesser Flamingo in Lake Natron.

The end piece from "The Crimson Wing",
a recent Disneynature feature film about the Lake Natron Flamingo, raised the question:

"For 20 million years, the Lesser Flamingo have lived and migrated amongst the lakes of Africa.
Many of these lakes, including Natron, are under serious threat from pollution and development.
How many more seasons of life and colour do the Flamingos have?
And, who will notice if they are gone forever?"

Preamble

In response to the above, Disneynature (DN), the Ramsar Secretariat, the African-Eurasian Waterbird Agreement (AEWA), in collaboration with the Government of Tanzania, agreed at Ramsar COP 10, in November 2008, to work as partners to establish a Lake Natron Trust Fund. A call was made for global action for the sustainable management of Lake Natron and the wise use of its ecosystem services for the survival of its people and the Lesser Flamingo (LF). Although the Trust was not funded, this proposal outlines the priority applied research framework that will provide valuable information to guide decision and policy makers on the future management of Natrons' shared ecosystems services that both sustain bio-diversity, livelihoods and economic investments.

1. Background

Over 75% of the global population of Lesser Flamingo depend on Lake Natron for their survival. Natron is significantly the largest, and therefore the singularly most important of only five known natural lesser flamingo breeding sites in the world. It is the only breeding ground for the estimated 2.5 million birds that are shared by 4 countries in East Africa (ie. Tanzania, Kenya, Uganda and Ethiopia). During the making of the Disneynature feature film, **"The Crimson Wing,"** observations were made that suggest Lake Natron is not only a unique Lesser Flamingo breeding ground but, hitherto unknown, is also a vital nursery and feeding area for young, pre-first flight flamingos.

Disneynature observe, of Lake Natron:

"More is known about the moon than about this remote and wild lake and its fabulous pink birds".

Lake Natron is "a last frontier" for LF research. It is imperative that research is undertaken to allow the creation and implementation of wise, sustainable land use plans that benefit not only Natron and the flamingos, but their custodians, the local people.

Consider:

a. There is no LF institutional memory available to the local managers, the community and district authorities. Almost nothing is known about the Lesser Flamingo's interdependence on Lake Natron. The last – and only – study concerning the breeding of Lesser Flamingos in East Africa is nearly 50 years old.
b. Almost nothing is known about the lake's complex hydrologic and geologic systems. The last study by BGS was in 1960. With the exception of recent volcanological research, no significant studies have been undertaken about Natron's unique and dynamic hydro-chemical environment, and associated flora and fauna.
c. Almost nothing is known about how many people depend on the lake, it's ecosystem functions and the flamingo, both economically and culturally. There are no significant socio-economic studies of local people and their dependence on the lake and its associated resources and ecosystem services. There is limited information available regarding the heritage and economics of flamingo tourism in the four East African

countries that host this bird.

d. There is no institutionalized land use plan for the lake, its catchment, its wildlife or its people – all of which are under increasing and serious threat from development, environmental degradation and climate change. The lake and all its dependents are part of a larger catchment ecosystem which currently faces threats (from globalization) such as climate change, hydro-electric dams, mining, large scale water extraction (eg irrigation), pollution, and un-restricted tourism developments. And locally from human livelihood needs which lead to deforestation for fuelwood, unregulated bushmeat hunting and over-grazing. Kenya's Lake Nakuru was in similar danger twenty years ago.
e. Lake Natron is one of our last, great wilderness areas. Local people live here in general sympathy with the environment, but the area is a desert and has a fragile water balance.

2. Factors Threatening Lake Natron and the Flamingo.

Threats to lake and the flamingo also include threats to the lake's hydro-chemistry and its structure, as well as its catchment area:

2.1. External threats:

The threats to the Lesser Flamingo include those beyond the control of its resident population, and are therefore the responsibility of government and global environment watchdogs.

The principle current external threat to Natron is the $300 million development proposal by TATA Chemicals and the Tanzania National Development Cooperation (NDC) to extract 0.5-1 million tons/year of soda from the lake for the purpose of satisfying the global market for glass clarification. TATA already operate such a factory at Lake Magadi, which lies 30 Km north of Natron and which is generally accepted to have an unlimited soda supply, so it is unclear why establish a new venture, until the existing one has been exhausted?

a. The global attention created by the Environmental Impact and Social Assessment (EISA) of the proposed Soda Mine appears to be more focused on the factory environs and its immediate social, physical and environmental impact. However, the likely and more critical threat to Lake Natron is the possible and profound changes to the lake chemistry caused by *long term changes in the overall soda-salt concentration and hydro-logical balance.* The Flamingos depend entirely on the trona for nesting material and building sites. Should this hard surface be depleted, damaged or flooded by mining (equivalent to an ice melt) *no nesting at Natron could occur*.
b. The TATA-NDC proposal calls for the removal of brine from below the trona. This may cause buckling, cracking and collapse of the trona surface due to changes in physical (hydrostatic) pressures (*Like ice on a pond*). Any such disruption to the relatively flat surfaces preferred by the nesting birds will doubtless *affect their desire and ability to nest*. Such a threat is especially serious in the north of the lake (the proposed mine site) where flamingos form elongate (or "reticulate") colonies along the edges of the trona plates.
c. The water needed for soda mining *will compete with the flamingo's need for freshwater* (to feed, drink and bathe) as well as human, livestock and wildlife needs, and would upset the lakes fragile water-balance.
d. Water abstraction will also *reduce the extent of the defensive moat that surrounds nesting sites*, and have an adverse effect on the annual cycle of soda island formation (ie salt accretion and dissolve), and could lead to early drying and open the way for terrestrial predators to access nesting sites.
e. The return of mined waste liquids (after soda salt extraction) to the soda plate surface, has a challenge of "where to put it". If returned to the surface, it could lead to *flooding of nesting and feeding grounds*, or dissolve the hard pack trona. If returned <u>under</u> the plates, this waste liquid would lead to hydro-static changes, buckling the plates, *affecting the flamingos desire and ability to nest.* In the longer term, this soda deficient material could contribute to a *change in lagoon water salinity*, not only affecting the soda cycle, but also affecting the unique micro-fauna that the adult flamingos (and very possibly, juveniles) and all other residents of the marsh (including endemic fish) depend on. Further, the wastes in the returned water, would mean in time, the lake's delicate chemical balance could be permanently altered and the silt load would intersperse and cover the soda… creating mud flats treacherous to fledglings during migration from nesting grounds to shore.
f. The soda ash project includes plans for a road/rail link from the lake, east through a significant stretch of wilderness (Lake Natron GCA) to Arusha, finally concluding in the port town of Tanga (where it ignites

another large-scale development of a reasonably pristine coastal area.). Currently, Lake Natron and areas directly south and east are protected as Game Controlled Areas (GCA). The tourist operators using these "blocks" for photography and hunting invest significantly in anti-poaching activities and local community (eg USD 2000/village/year). Should the soda factory and its invasive road and rail link go ahead, there is a great likelihood the disturbance will scare wildlife away, leading to the operators abandoning the blocks, *leaving no protection for wildlife and precious catchment systems*.

g. A Natron-Arusha road-rail link will bring increased human settlement not only to the factory site but all along the route. This infrastructure system and associated human immigration will effectively bisect a north-south wildlife migration corridor between Kenya and Tanzania and *increase pressure on the resources of a crucial part of the lake's catchment area.*
h. Human waste created by the factory and road-rail settlement may increase the numbers of Marabou storks (and hyenas/baboons, etc) resident to Natron, leading to additional problems for the flamingos with *increased predation and disturbance of chicks.*
i. Increasing human settlement in the entire Lake Natron catchment (from the soda mine, tourism and local expansion) will augment incipient threats. Degradation from cattle, sheep and goats overgrazing, loss of forest cover due to fuelwood, charcoal, curio and timber extraction, declining river flows due to excessive water abstraction for domestic, industrial and irrigation (Tanzania and Kenya), and pollutants from wastes from settlement, livestock treatment and sewage, and fishing will increase.
j. Global warming can be expected to change the fragile hydrological dynamics of the lake, with as yet unknown effects, but if the 2009 drought is an example of things to come, then this will be devastating.

2.2. Local threats:

Threats to the Lesser Flamingo from local population livelihood actions in the catchment, and therefore in need of "wise use" technologies for suitable alternatives, include:

a. Catchment irrigation in rivers draining into Lake Natron will interfere with the hydrological balance – *reducing the protective moat,* and potentially reducing nutrients brought into the lakes primary production zone, from run-off. Proposed large irrigation schemes in Tanzania (OXFAM) and Kenya could compound this problem – as will those currently operating in Kenya and Tanzania, unless sustainably managed and minimal environmental flows are assessed and maintained.
b. Current plans for the GCAs to become Wildlife Management Areas (WMA), will allow the people living around the lake to more collectively and directly financially benefit from wildlife tourism and the flamingo heritage on their lands, while also requiring their increased responsibility for it. With little capacity and experience, and should the current tourist operators abandon the GCA, these people will inherit the problems associated with the soda ash development and the protection of the wildlife, currently afforded by the operators. Though they may have significant pride and enthusiasm for their heritage, *the local residents are woefully unprepared for the free-for-all* that will likely follow in the development's wake.
c. Lake Natron's catchment is made up of very thin, very fragile and friable volcanic ash soils. Any damage to these soils by human livelihood activities would also affect the hydrological cycle. The catchment environment is sensitive to erosion from poor agricultural practices, deforestation for timber, curio carvings, fuelwood and charcoal, as well as damage to vegetation cover caused by uncontrolled bush fires, or as a result of overgrazing due to excessive livestock. Damage will increase run-off rates, and thereby reduce percolation and therefore adversely affect water quantity that recharges the many springs and rivers. Trouble then flows downstream as increased erosion rates lead to greater siltation and possible damage to the mudflats and change water clarity in Natron. All of this will *adversely affect the productivity of the flamingo feeding grounds.*
d. Lake Natron is a closed environment. Anything that washes into the basin will stay there permanently. Given the low dilution levels classical of soda lake (ie Natron is only 10% liquid), sewage wastes and other chemicals used in the catchment (for example waste dumps, oil spills, dips, pesticides, agricultural fertilizers and drenches for livestock) could accumulate and lead to *eutrophication or poisoning the lake*, changing or killing its unique micro-algae populations, poisoning the flamingos. This is the well-documented current situation in Kenya's Lake Nakuru. It is important therefore to manage sustainably human settlement, road infrastructure, responsible development of future tourist facilities, agriculture, irrigation and livestock practices in the catchment area to ensure they do not pollute or poison the environment.
e. Lack of knowledge about the lake and the flamingos means that no meaningful management and

conservation plans can be created, at this time. While a "precautionary approach" should be taken in the face of such a glaring inadequacy, proponents of invasive developments have in fact used this dearth of information as an argument in favour of their projects: "*there are no facts to show such developments would be destructive"*. However, this proposal calls for applied research to fill in the gaps, before developments take place to ensure that the environment, livelihoods and the flamingos are not compromised.

f. Without proper land use plans the people of the lake cannot benefit from increased tourism, an expected consequences of the *"Crimson Wing"* film. Therefore, *they will have little reason to protect the lake or the flamingos*. Needed is to understand the current economic importance of the ecosystem services shared with the flamingo to the local, EAC and regional community, and to mobilize these vested interests to invest in the future sustainability and security of local livelihoods and their income.

3. The Global Importance of Lake Natron

Lake Natron is a wetland of international importance because:

a. It is key to the survival of over 75% of the global population of Lesser Flamingo (LF).
b. It is the only breeding ground for the estimated 2.5 million East African LF population.
c. It is one of only five known natural breeding sites of the Lesser Flamingo in the world.
d. It is an important site for breeding Avocets (a migrant bird) which also nest on the soda plates.
e. It is home to a unique species group of fish, the Alcolapia, which are found only at Natron, and which observations made by "**The Crimson Wing"** team suggest might form a unique, undocumented speciation diversity, analogous to Darwin's finches, (over and above the four species which are currently recognized).
f. It is also a wintering home to over 100,000 migrant waterbirds, including Little Stints, Ruffs, Curlew Sandpipers and other palearctic waders all of which are species to which the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) applies.
g. In Tanzania, its catchment provides a livelihood for 15-20,000 people, mostly Masaai and their associated livestock, whose local culture is still relatively intact, and who are, generally naive, and vulnerable to exploitation.
h. In Kenya, the catchment services provide a livelihood for as many, if not more people, who benefit from irrigation use of the catchment waters.
i. It is a reasonably intact wilderness area where humans and wildlife currently co-exist with minimal conflict and an important hunting block for 2 concessions.
j. It is the only source of flamingos that sustains the EAC and Ethiopian population and its extended, regional tourism economy.
k. The catchment is a buffer for fellow Masaai living in Kenya, who, during the 2009 drought, migrated across in significant numbers with their livestock to take refuge by grazing and watering their animals in the less densely populated plains surrounding Natron.

Tanzania and Natron's local people therefore need support from the global community to create a proper management plan and to invest in its sustainable implementation to ensure ecosystem services are not compromised for present and future generations of humans and bio-diversity.

4. Proposed Research Framework

The need for more science to sustainably manage Lake Natron ecosystems services and its biodiversity is acknowledged by the inputs from the IUCN SSC International SSAP (2006) on the Lesser Flamingo and both the Kenyan and Tanzania national SSAPs. These provide a prioritized, solid template for multi-year, time-sequenced studies that address:

4.1. General knowledge gaps

a. Do the Lesser Flamingo use Lake Natron equally all year-around, or do they use it primarily for breeding, and then go elsewhere when not breeding?
b. How often do they use the fresh water inflows for feeding, drinking, bathing and feather care?

4.2. Breeding knowledge gaps

a. How many pairs breed on the lake each year? What is the success rate?
b. Where exactly on the lake do they breed and on what specific substrates? And why?
c. When during the year do they breed, and what are the triggers initiating this process?
d. What are the threats during breeding?
e. What is the timing of courtship, nest building, egg laying, hatching, fledging, and first emigration from the lake?
f. How many young are hatched each year?
g. What are the prime causes of mortality in young, and how many survive to fledge each year?
h. How are answers to the above questions related to variances in environmental conditions, primarily the amount of rainfall and the degree of surface flooding as well as water chemistry and plankton dynamics?
i. How is hatching and breeding success affected by various types of disturbance and flooding?

4.3. Feeding Knowledge Gaps

a. How many individuals of each age classes (chicks, immature and adults) feed in the open waters and mudflats of the lake?
b. Where on the lake do the adults, immature and young feed, and in what habitats? (Soda islands, foreshore waters, mudflats, etc.)?
c. What is the adult, immature and young diurnal feeding pattern? Are these location specific? And how are these patterns and locations affected by environmental conditions?
d. When do the chicks first feed? And what % of the crop milk is supplemented by self-feeding on solid food, such as organic mud or plankton?
e. What is the importance of cyanobacteria, diatoms and aufuchs (organic mud) in each feeding zone?
f. Are there seasonal and spatial variations in the above and why?
g. What is the source of nutrients driving the primary productivity of the Lake? How much is endogenous and how much exogenous?
h. Do the breeding birds feed primarily on Lake Natron, or do they fly to other feeding locations, such as Lake Empakai, or Manyara?
i. For how long do the fledglings stay and feed at Lake Natron before first emigration? Is this significant?

5. Importance of Observations Made During the Filming of "The Crimson Wing"

Already, specific observations made by the filmmakers partially answer some of the above questions – although, being anecdotal, they require rigorous scientific verification before application. As the only people to have ever spent significant time not only on the soda salt flats (several months), but also amidst the lake environment (more than two years), the filmmakers believe that the following observations must be given priority for applied research:

5.1. Breeding Success and Lake Water Levels:

The breeding on Natron appears to be more flexible than hitherto believed. Breeding events can occur throughout the year and appear not to be restricted to the narrow time period where universal, synchronized breeding is framed by the onset of the rains. In addition the formation of colonies is often prolonged (as mentioned by Brown and Root) so that different areas within each individual colony (and around the lake) may be composed of birds at very different stages of the nesting cycle.

Perhaps the most critical factor to breeding is the moisture content of the soda, a factor determined by rising or receding water levels, and rainfall. This moisture content plays an important part in site selection and therefore, successful nest construction, as well as timing (seasonality) of breeding. It would appear that Greater Flamingos are the pioneer nesting birds, as small groups of these larger birds are often found initiating a colony, while Lesser Flamingos follow later, infilling areas between the Greater Flamingo nests, and expanding the colony outwards. Incubation attempts prior to the end of the rains can be threatened by nests becoming dissolved if excessive rains (or winds) induce flooding. Receding water (post rain) not only provides suitable soda surfaces for nest building, but may also expose new organically rich muds on the far shore mudflats, or (if the water goes lower) exposed mudflats on the island shores nearer the nesting areas, offering opportunities for supplemental

feeding by chicks.
Lake waters in lagoons, may provide a moat of security around nesting grounds, isolating nursery areas from man and ground based predator disturbances. However, rain fed puddles or high water levels near nests, can induce mud or soda crystallization as anklets on the chick legs, feet and/or as soda accretion from the parents legs, covering and smothering incubating eggs and significantly reducing hatching rates.

5.2. Breeding Success and The Chick Stage:

While it is well known that flamingo young are obliged to derive the bulk of their nutrition from their parents as "crop milk," the filmmakers observed that young birds appear to derive an increasing percentage of food from self feeding in Lake Natron itself, both as they age to fledgings and as immature birds before they leave the lake for the first time. This behaviour has apparently been overlooked by researchers, and observers believed these actions to be "a need to drink freshwater!". Brown and Root's study was a generalized overview. Other studies have been more focused on the survival, feeding behavior and needs of the adults, however, Harper (Pers comm) concurs with this idea.

The filmmakers observed that young flamingos have their own unique supplemental feeding patterns, which, due to under-developed dentition, are distinctly different from the filter feeding behavior of adults. A hitherto un-described feature of Lake Natron would appear to be its unique ecosystem qualities and primary production levels which allows for feeding opportunities not only for adults, but also, and very importantly, for chicks and immature birds. Thus, in addition to the "one-stop-shop" of provision of an environment for successful nesting, incubation and nursery care of the young, Natron appears to offer fledglings and juveniles an additional food source in the mudflats and foreshore.

New light thus can be thrown on what has previously been described as "a daily migration to *freshwater* for chicks to bath and drink". It appears that, *additionally*, the mass crèche migrations witnessed of chicks are actually actively towards feeding areas. Feeding on and ingesting organic elements in the mud substrate (perhaps auwfuchs = organic rich muds) by paddling and displacing the mud underfoot, and apparently swallowing liquefied organic mud, was perhaps, earlier mistaken for "drinking". This may well be an important supplement to parental milk and could be supported by observations by Brown and Root of Magadi. Here, the fledging period was recorded as extended to 90 days, 20 days longer than the normal 70 days on Natron. This suggests that as the young could not source food from Lake Magadi, the adult birds had to source food from other lakes (ie Natron and Empakai), therefore, the additional 30% of time needed to fledge, represents the proportion of time saved on Natron by self-feeding. In addition, as the young fledglings remain at Natron for a significant time period before they are ready to fully emigrate away from the catchment, during which time the filter feeding apparatus and the body proportions of each bird becomes fully developed for flight and filter feeding.

Chicks and fledglings appear to exhibit different body proportions to adults, especially in tarsus length, and influences their flight capacity. This could be a feature categorized by different bone density and structure. The required high levels of calcium needed for bone growth may be limited in "crop milk" and might be satisfied by supplemental feeding on calcium rich, organic muds, loaded with diatoms and minerals.

Thus it appears Lake Natron plays a significant, but as yet unquantified role in the initial feeding and early development of the Lesser Flamingo, and the interface between parental-and self-provisioning needs to be better understood and studied as it has great significance of attachment to the water balance of the Lake.

5.3. Aerial Predators:

At Natron this threat exists most significantly in the form of Marabou Storks, but also, possibly (in the winter months) migrant Aquila Eagles. Predation of Flamingo colonies has been estimated to contribute 5 % of mortalities (Brown and Root), yet this figure is likely to be an underestimate Aberhard (Pers Obs).

Direct predation by Marabous can cause significant losses of eggs and chicks in and around the nesting areas. In addition, and perhaps much more seriously, such direct predation also causes huge disturbance within the affected flamingo colony, which can, often lead to abandonment of nests, or egg damage caused by panic amongst incubating or brooding parents. Such disturbance can cause the dislodgement of newly hatched chicks

from their nest mounds, which can lead to deaths from exposure, development of anklets and trampling on the salt flat floor. Starvation of chicks is an important source of attrition, and can be the result of a separation of the chick from its parents. Although flamingos have an uncanny imprinted individual call recognition, it is not impossible for a parent bird to lose its chick in the vast areas of the colony during periods when thousands of birds are stampeded within the colony. Indeed creche formation may have a significant value to the parent birds in that they can locate a chick within an easily visible congregation, perhaps finding this impossible to do so in a situation where chicks scatter and become distributed evenly (randomly) over many square kilometers of soda flat, and cannot hear nor distinguish a parent's call sign.

6. Objectives of the Research

Details of these research proposals are elaborated in a Logical Framework Analysis and in depth methodology and budget are available separately. The main thrust of these studies is to understand the influence of water balance on water levels and water chemistry on flamingo breeding, and include the consequences of potential catchment pressures on ecosystems functions and services:

6.1. Studies to Understand the Breeding Biology of the Lesser Flamingo:

Objective: To link potential changes in chemistry and water level on the breeding, and survival of the Lesser Flamingo.

Expected Outputs:

a. Historical analysis of the behavior patterns of Lesser Flamingos nesting and crèche movements on Lake Natron from available historical and current satellite imagery and climatic data (where available).
b. Satellite tracking of selected flamingo adults to determine the courtship, breeding migrations and importance of external feeding grounds to flamingo breeding at Natron, and their key feeding lakes (eg Empakai).
c. An analysis of the relationship between water levels and successful nesting and incubation, though the remote camera monitoring of colonies occurring during the study period.

6.2. Studies to Understand the Early Feeding Biology of the Lesser Flamingo.

Objective: To Link the Ecology of Lake Natron to the Feeding and Survival of Lesser Flamingo from Chick to Immature Stage.

Expected Outputs:

a. Satellite tracking and mass ringing and colour coding of different crèches, to understand the circadian feeding cycles and behavior patterns of the different stages in development of the Lesser Flamingo from juveniles to first flight from the Lake of the immature stage.
b. A less intrusive analysis of the crop and fecal matter to assess the importance of parental milk, and of supplemental feeding on cyanobacteria, diatoms and organic mud to the nutrition of the different developmental stages of the Lesser Flamingo young up to the time they leave the Lake.
c. A detailed remote camera study of the feeding behavior of the juvenile birds from crèche to fledged juvenile and immature stages, and feeding behaviour on Lake Natron.
d. An analysis of water levels on lake chemistry and associated primary productivity of cyanobacteria, diatoms and organic muds (auwfuchs) on the islands, in the foreshore waters and mudflats.
e. A laboratory bio-assay of the influence of soda dilution on the intensity of primary production described above, and the likely impact of turbidity (ie from soil run-off).

6.3. An Assessment of the Losses due to Predation and Disturbance.

Objectives: To determine to what extend predators (like Marabou Storks) and other forms of disturbance are a threat to the nesting and survival of developing young Lesser Flamingos

Expected Outputs:

a. To establish annual counts and satellite tracking of the Marabou Storks and jackals on Lake Natron.
b. To assess the impact of direct predation by remote camera sensing.
c. To assess indirect losses due to disturbance of breeding colonies, including the effects of separation of chicks from parent birds and crèches (starvation) and anklet formation, by remote camera.
d. To look at less intrusive ways of dealing with the problem, such as translocation and satellite tracking of the problem birds.
e. To establish a better understanding of the effects of Tourist / Sightseeing over-flights of colonies

6.4. Studies on a Symbiotic Balance between Lesser Flamingo and Improved Livelihoods of its Custodians.

Objectives: To ensure that the local community benefit from the growth in tourism in the area, without compromising the environment for the Lesser Flamingo.

Expected Outputs:

a. A study of the rate of deforestation (for fuelwood, charcoal, timber or curios) in the catchment, and the likely impacts of run-off and erosion on water levels and water quality (ie turbidity) of the lake. Establish, implement and monitor a sustainable forest catchment management plan.
b. A study of current agricultural practices and irrigation schemes (traditional and commercial) in the catchment: the use of pesticides; erosion consequences; the level of abstraction of water; and the effect on water flows and chemistry. Undertake an Environmental Flow Assessment to develop an irrigation management plan based on the minimal flows that must be maintained to ensure least impact on the lake and associated flora and fauna, and to introduce sustainable agricultural and irrigation practices.
c. A study of current livestock levels and chemical treatments (ie dips and drenches) and the impacts they have on water and grazing lands; of the resultant impact of pollution, erosion and run-off rates and siltation on the Lake; of the economics of pastoralism and cultural significance values. Install rangeland and herd management plans based on carrying capacity that fits the needs of the people and the local environment.
d. A study of current tourism and human settlement in the catchment, looking at water use and wastes (ie liquid, solid, sewage and chemical) to establish local standards and by-laws (for environmental impact assessment) to sustainably manage the use of water and disposal of wastes; and to establish a responsible tourism code of conduct.
e. To study the economic value of flamingo tourism and associated values locally, regionally and globally, assessing the direct value to people (by locality) from flamingo tourism, flamingo branded products, and the like to secure empathy for the protection of Natron; to show global value. To appeal for support for the Trust Fund for local community developments (ie schools, boreholes, clinics, etc) and associated environmental awareness.
f. Development of a Flamingo Visitor Information Centre established at Natron (perhaps Makat side), screening **"The Crimson Wing"** and other features, a museum from which revenues will go to a shared local community development fund, or to support schools with educational programs on nature and conservation.
g. A study of the economic values of the wilderness in the entire catchment area (and of current illegal uses, for Bushmeat), and look at value added products, a Tourism Development Plan, in order that greater wilderness revenues can be shared through a local development fund. Such a fund should link all associated villages under the umbrella of the two Wildlife Management Areas and support specific village sustainable development micro-projects in the catchment.

7. Development of a Ramsar Office and a Research Station at Natron

As part of the Ramsar Site, the Wildlife Division (with current support from the Danish Government) will place a full-time Ramsar Site Project Manager at Ngaresero with an office, support vehicle and equipment. This office: will coordinate the preparation and implementation of the Integrated Management Plan; will include site actions into the District and Village Development Plans; and will assist the implementation of the WMA process.

While the Ramsar Office will look at implementation of the IMP, there will also be the need for a designated Research Station to fulfill the scientific objectives.

This proposal considers:

a. To sub-contract the research to an international research institution to coordinate, under the supervision and guidance of the Trust (to-date WCS, Leicester University and Illinois University have expressed interest to participate, singularly or in combination).
b. The facility at Makat (used by the filmmakers) will be made available by its owners, Tanzania Game Trackers (TGT) to the program for upgrade as a research station, with suitable office, laboratory and accommodation facilities for the scientific officer and two-to-three guest scientists/students.
c. This will include placement by the international organization of a Senior Scientist to lead the research, to be based full-time at the Lake (for up to five years).
d. TAWIRI and Tanzania Wildlife Division will be involved as government counterparts, and will have the option of placement of staff seconded to the program to undertake higher degree studies (two PhDs scholarships are proposed; one in breeding, the other in feeding), linked to local and overseas universities.
e. To ensure local exposure, SUA University in Morogoro (or UDSM or both) will be linked to the research, to supervise the two PhDs and to organize student outings to gain experience in alkaline lakes, bird capture, ringing, satellite tracking, remote sensing, GIS, sample collection, and general ornithological techniques.
f. The Station will need a vehicle and muffled motorcycles or quad bikes for the research teams.
g. The current Disneynature equipment, namely the hovercraft, could be donated to the Trust, or procured.
h. The additional existing equipment at the Makat site could similarly be donated to the Trust, or procured.
i. Provision must be made for the site office with furniture, laptop computers, printers and any other administrative equipment.
j. Likewise, provision must be made for the site laboratory, with sampling devises, analysis kits and sample preservation (for future analysis at home base).
k. Provision must be made for remote cameras, security stands, timers, extended batteries, and other remote monitoring equipment, including, for example, weather stations (if Disneynature decides to invest in future informative documentaries then this equipment could come from a separate budget for production).
l. As security, local Maasai would be hired through the community as security guards to watch the equipment, mostly the remote cameras.
m. A detailed budget for the station, staff, equipment and operations is attached (Annex 2).

8. Proposed Research Program

This section highlights key research which must be first and foremost be conducted on the Lake Natron environment and its catchment to understand the unique affiliation of the flamingo with the Lake and its people, to better institute a sustainable management plan.

8.1. Breeding Behaviour LF:

Studies to Understand and Better Manage the Breeding Behaviour of the Lesser Flamingo, Relative to Climate and Hydrological Conditions of Lake Natron.

Null Hypothesis:

Water levels and salinity play a key role in courtship, nesting, incubation and crèche success (the recruitment rate) of Lesser Flamingos at Natron

Objectives:

To Link the Ecology of Lake Natron and the Importance of its soda plate flats, to the Breeding Biology and Breeding Success of Lesser Flamingo.

Expected Outputs:

a. Historical study of the nest building vs lake levels, climate, etc.
b. Real time study of courtship, nest building and egg incubation.
c. Study of adult migration, diurnal, breeding and feeding of young.

Methodology:

a. Historical analysis of 20 years of satellite imagery of nesting patterns from available satellite data (if resolution allows) to discern nesting polygons.
b. From historical, available satellite imagery, relate breeding behaviour to climatic variables and water level
c. Establishment of a climatic recording station at Lake Natron to record throughout the period, climatic variables.
d. Real time satellite imagery analysis of minimum 2 years of nesting patterns, and
e. Coupled with aerial photographic studies of diurnal patterns and seasonal variations in nesting, and
f. Coupled with ground truthing to count nests and failed eggs.
g. By remote camera imagery set up at nesting sites, collect time sequenced stills images of behavior, nest building, incubation, first feeding etc
h. Satellite tracking of 40 breeding adult flamingos, to understand circadian nesting, first feeding cycles and the relative importance of Lake Natron vs other lakes to the provisioning of developing young flamingos.
i. Analysis of the relationship between water levels, water chemistry, etc and successful nesting and incubation.

8.2. Feeding Behaviour LF:

Studies to Understand and Manage the Feeding Behaviour of Lesser Flamingo Chicks, Pre-fledging and Immature Birds, in Lake Natron, and the Influence of Water Levels and Water Chemistry on Food Types.

Null Hypothesis:

The developmental stages of the Lesser Flamingo are dependent on Lake Natron as a supplemental feeding ground.

Objective:
To link potential changes in chemistry and water level on the feeding and survival of the Lesser Flamingo, from chick to immature stage, for sustainable management to improve survival rates.

Expected Outputs:

a. Understanding of historical feeding patterns on Lake Natron vs climate vs water level.
b. Linking climatic changes and water levels to chick and immature feeding behavior.
c. Understanding of different stages of Flamingo development (chick, immature and adult) feeding patterns and diurnal movements.
d. Understanding the productivity of the lake in terms of cyanobacteria, diatoms and organic muds and the relationship of this and importance to the stages in the life cycle of the Flamingo.

Methodology:

a. Historical analysis of 20 years of satellite imagery of feeding and crèche and adult distribution patterns from available satellite data (if resolution allows) to discern patterns in visible polygons (ie zoning the lake into nesting and feeding grounds).
b. Satellite tracking of 40 chicks and 20 immature birds, to understand the circadian feeding cycles and behavior patterns of the different stages in development of the Lesser Flamingo from chick to immature stage.
c. From the above remote camera imagery on nesting sites, an analysis of the importance of parental milk, and study on feeding stimulus through the early stages.
d. Through remote camera imagery set-up on feeding grounds and mudflats, obtain photographic stills of diurnal and seasonal feeding patterns.
e. Through mass colour ringing of crèches, monitor details of the feeding migration and drinking behavior of the juvenile birds from crèche to immature stages on Lake Natron.
f. Couple this with hilltop remote camera imagery of photographic stills to determine diurnal and seasonal patterns of movements from crèche to feeding ground and back.
g. Take regular samples of water and mudflat quality, near shore and far shore of the “moat”, and analyse for salinity, chemistry, and food organisms (cyanobacteria and diatoms and organic mud = Aufwuchs).
h. Looking at seasonal changes in each food type, in calorific, nutrient and chlorophyll content.
i. Abstract (during ringing) humanely collected fecal and gut samples from a size range of birds to ascertain

their % content of parents milk, filter feeding of cyanobacteria, diatoms and organic mud.

j. Assess the contribution of each to the nutrition of the different life cycle stages of the Lesser Flamingo young up to the time they leave the Lake.
k. An analysis of the relationship between water levels and feeding patterns.
l. An analysis of water levels on lake chemistry and associated primary productivity of cyanobacteria, diatoms and organic muds.
m. A laboratory bio-assay of the influence of different soda dilution levels on the primary production described above.

8.3. Predation and LF Biology:

An Assessment of the Management of Lesser Flamingo Losses due to Predation and Disturbance.

Null Hypothesis:

Losses due to direct predation and indirectly due to disturbance, can lead to 58% mortality.

Objectives:

To determine to what extent predators like Marabou Storks (and other predators and forms of disturbance) are a threat to the survival of juvenile birds.

Expected Outputs:

a. Estimated percentage losses due to direct predation by Marabous through emote camera sensing.
b. Estimated percentage indirect losses due to disturbance and other environmental factors (separation and starvation) anklets, and salt accretion.
c. Estimated percentage losses due to other forms of predation (Aquila eagles and Jackals)
d. Establish a humane mechanism of reducing the Marabou problem by satellite tagging and selected distance displacement from the Lake.
e. Establish a greater understanding of the possible effects of Tourist over-flights on Flamingo colonies

Methodology:

a. Ring individual Marabou Storks on Lake Natron to establish size of population using the Lake Catchment.
b. Through satellite tracking of at least 10 Marabou Storks, determine their diurnal and seasonal movements on Lake Natron (and elsewhere) in relation to the Flamingo breeding cycle.
c. From the above stills photography of nests, estimate the damage done by marabous by direct ingestion and indirectly by abandonment, and exposure
d. Collection and analysis of abandoned eggs in Marabou affected colonies to assess hatch failure and impact on potential hatching success.
e. Analysis of distribution of dead chicks in and around colonies with post mortem analysis of corpses to indicate likely cause of death.
f. To look at less intrusive ways of dealing with the Marabou problem, such as translocation of the 10 satellite tagged problem birds, to determine if they return.

8.4. Ecosystem Services and LF Biology:

Studies on the Symbiotic Balance between Lesser Flamingo and its Sustainable Management for Improved Livelihoods of its Custodians.

Null Hypothesis:

The Lesser Flamingo has a cultural heritage and economic significance to the lives of people in the area (and East Africa Region).

Objectives:
To ensure that the local community benefit from their heritage, and the growth in tourism in the area, without compromising the environment for the Lesser Flamingo.

Expected Outputs:
a. Sustainable catchment forest management included in local development plans.
b. Sustainable catchment agriculture and irrigation management included in local development plans.
c. Sustainable catchment livestock management included in local development plans.
d. Sustainable settlement and tourism management included in local development plans, and a responsible tourism code of conduct established.
e. Sustainable catchment wildlife management included in local development plans.
f. Economic value of flamingo management included in local development plans.
g. A Flamingo Tourism Information centre established, catering to both tourists and local Tanzanians, including school children, giving information about the area, its vulcanology including a module on the Flamingo (the Getty Foundation's Olduvai Gorge Visitor Center is a splendid example). Schools supported in educational programs on nature and conservation, including funded school trips to the Visitor Education Center.
h. Communities engage in conservation through two WMAs.
i. The above development plans implemented through Village micro-projects supported in sustainable development.

Methodology:
a. To list the ecosystem services of Lake Natron and ecological links to Lesser Flamingo.
b. A study of the rate of deforestation in the catchment, and its reasons for fuelwood, charcoal, timber or curios and impacts on run-off and erosion and affects it has on water levels and water quality (ie turbidity) of the lake, and establish, implement and monitor a sustainable forest management plan.
c. A study of current agricultural practices and irrigation schemes (traditional and commercial) in the catchment, the use of pesticides, erosion consequences, the level of abstraction of water, and the effect on water flows and chemistry. Undertaking an Environmental Flow Assessment to develop an irrigation management plan based on the minimal flows that must be maintained to ensure least impact on the lake, and to introduce sustainable agriculture practices.
d. A study of current livestock levels and chemical treatments (ie dips and drenches) and the impacts they have on water and grazing lands. Of the resultant impact of pollution, erosion and run-off rates and siltation on the Lake. To look at the economics of pastoralism and cultural significance values, to instill rangeland and herd management plans based on carrying capacity, and that fits the needs of the people.
e. A study of current tourism and human settlement in the catchment, looking at water use and wastes (ie liquid, solid, sewage and chemical) to establish local standards and by laws to sustainably manage the use of water and disposal of wastes. To establish a responsible tourism code of conduct, tourism zoning or plan for the area, a guide to eco-friendly tourism investments, developments and sets standards for tours, and small aircraft fly-overs, and a training of local guides.
f. To study the economic value of flamingo tourism and associated values locally, regionally and globally, assessing the direct value to people (by locality) from flamingo tourism, flamingo branded products, and the like to secure empathy for the protection of Natron, to show global value, and appeal for support for a Trust Fund for local community developments of schools, boreholes, clinics, and associated environmental awareness.
g. At Makat, and a smaller unit at the Ramsar office (Ngaresero), a "Flamingo Tourism Information Centre(s)/ Visitor Education Center" shall be established, to show a museum of the Flamingo and the volcanic geology of its environment, coupled with exhibits, photographic and cinematic. **"The Crimson Wing"** (and any possible subsequent films) might be screened here and revenues may go to a shared local community development fund.
h. Forming of two Wildlife Management Areas from what are currently two Game Control Areas (Lake Natron North and South), currently managed as hunting blocks. To rally 30 villages, including 14 from the Lake Natron catchment to form conservation organizations to manage wildlife on their village lands, as per agreed bylaws, and for added value from tourism (photographic and hunting), contributing to local needs.
i. Schools in the area would benefit from supported in educational programs on nature and conservation. This can include publishing brochures and leaflets for awareness raising, screening of **"The Crimson Wing",** and installation of DSTv special educational TV and satellite packages in schools for educational purposes.

j. As part of the IMP, district and village action for sustainable development will be called for through Wetland Friendly Investments. This can include Village micro-projects in sustainable development of pastoralism, traditional irrigation, sustainable fisheries, use of timber and non-timber products in the catchment, and the pressures on wildlife from poaching for food or income.

9. Budget

A separate detailed budget is available.

Annex 5

Lesser Flamingo Bibliography and Reference List

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FIGURES

Tanzania National Single Species Action Plan 2010-2020 for the Conservation of the Lesser Flamingo (Phoeniconaias minor)

Figure 1:

Map of the Key Lesser Flamingo Alkaline Soda Lakes in the East Africa Rift Valley

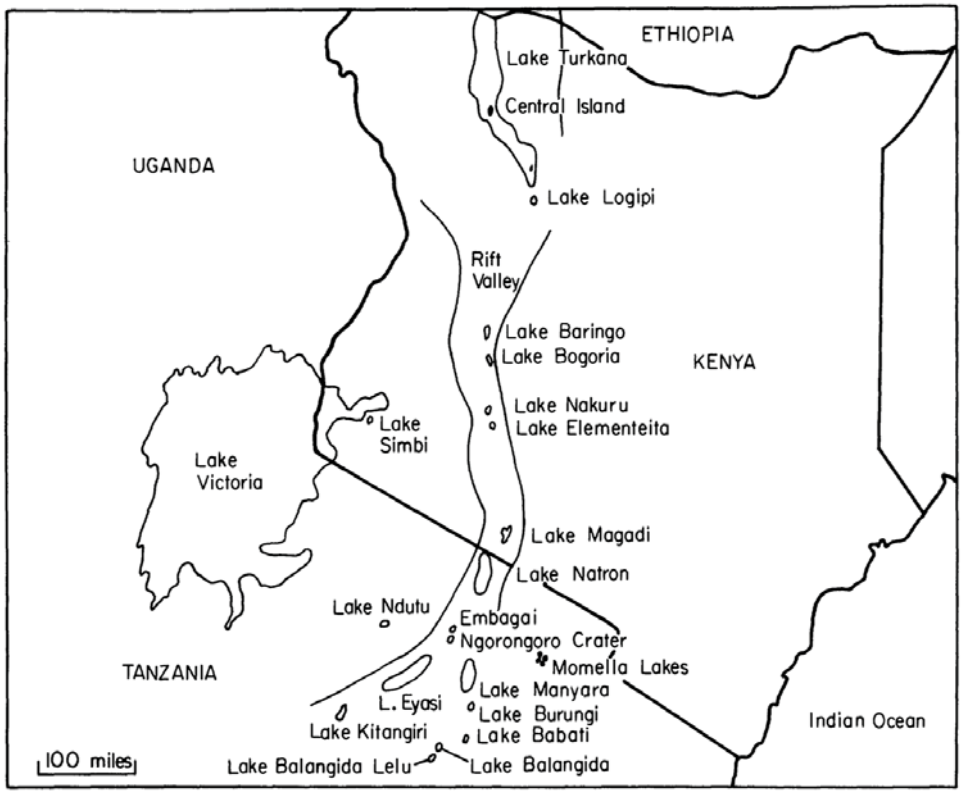
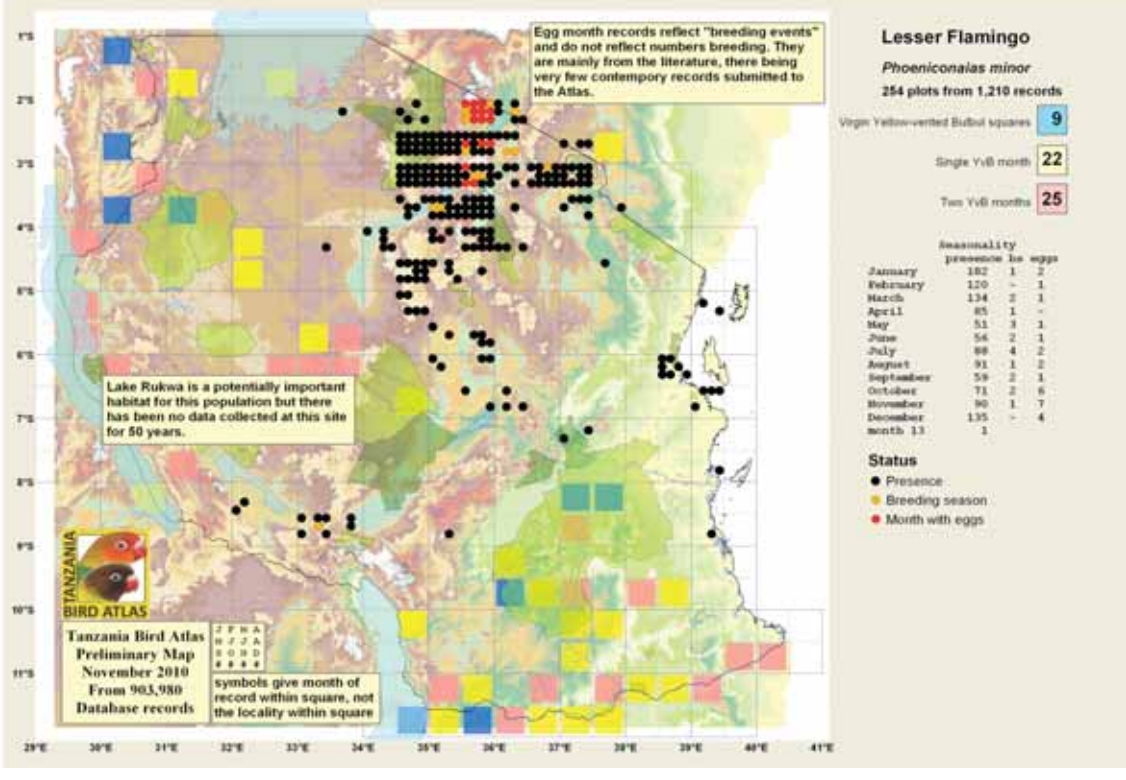


Fig 1. the study range showing locations of lakes which were censused

Figure 2:

Distribution of Lesser Flamingo In Tanzania and Sites which meet Ramsar Criteria

(Source: Tanzania Bird Atlas, 2009)



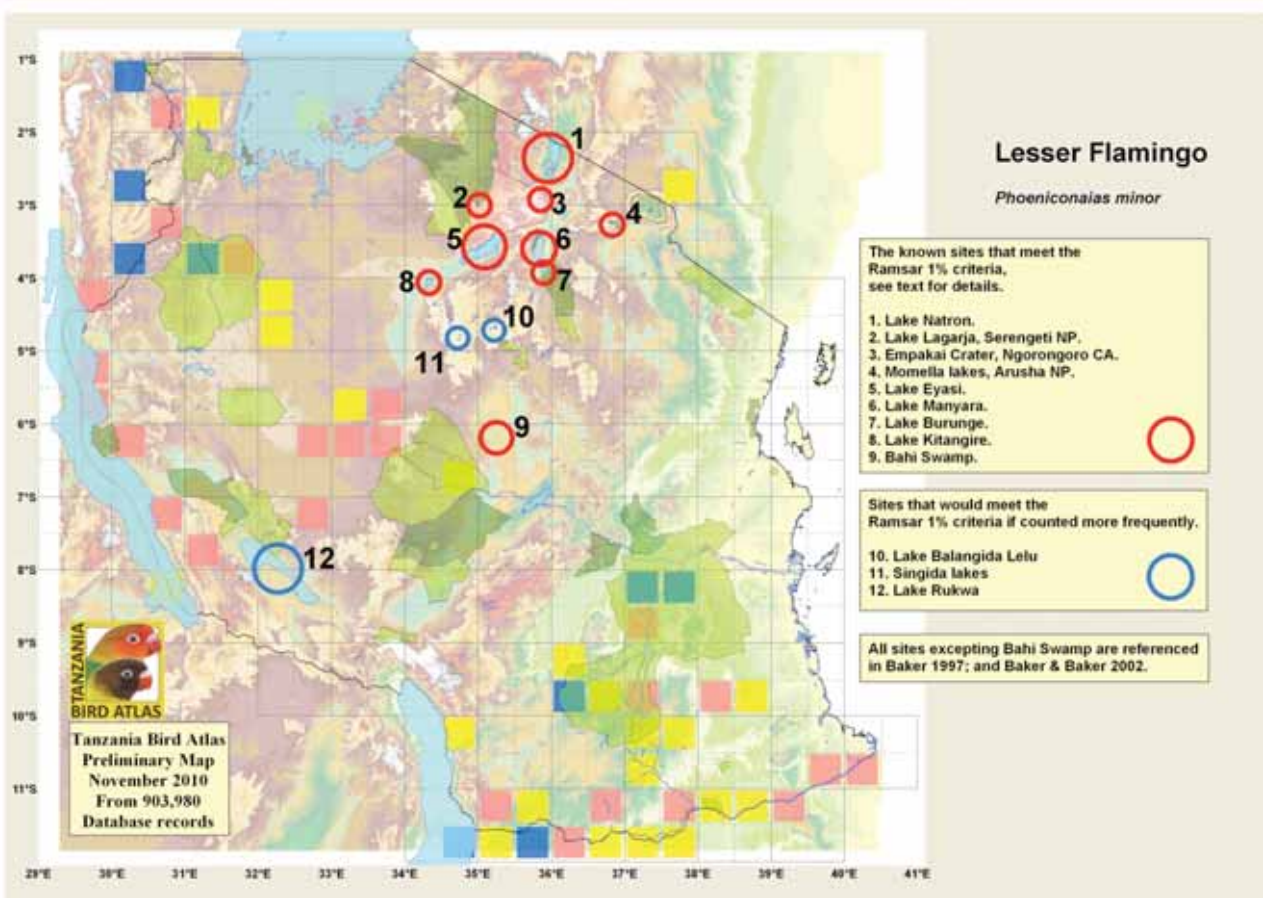


Figure 3:

Trend in Lesser Flamingo Numbers in Kenya (1992 to 2007).

(Source: Waterbird Census Reports, estimated using counts in the months of January).

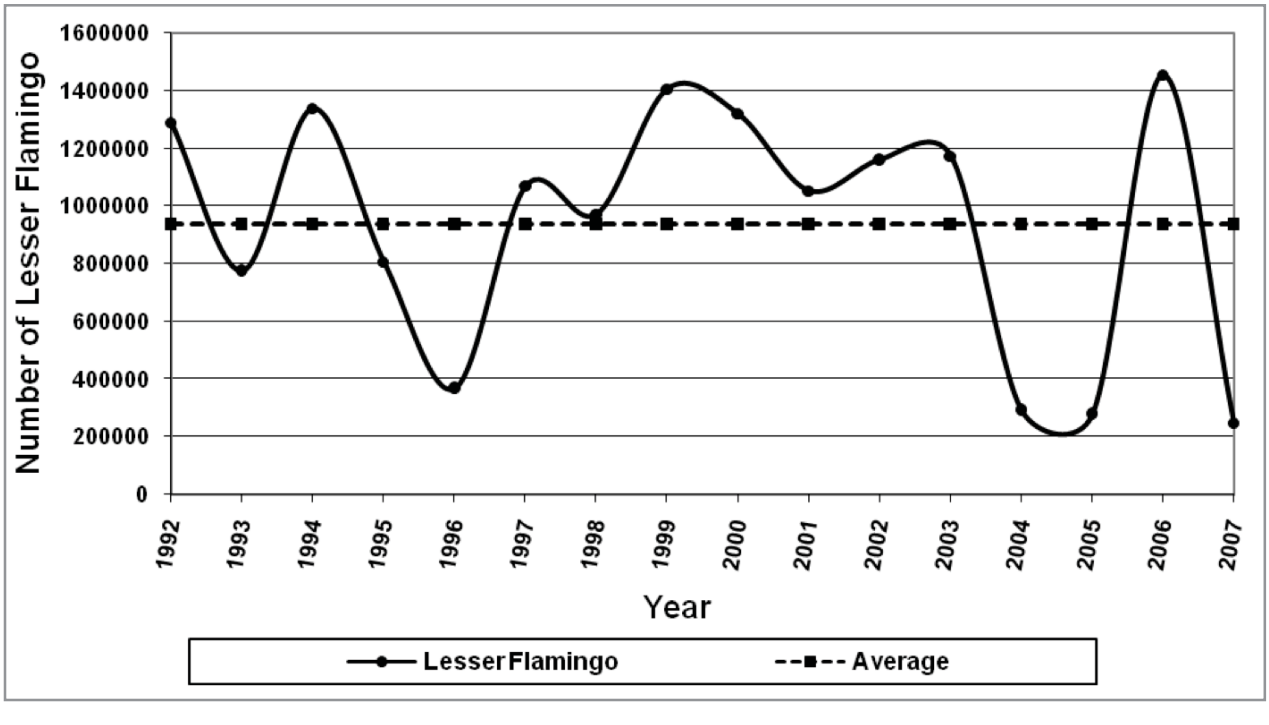
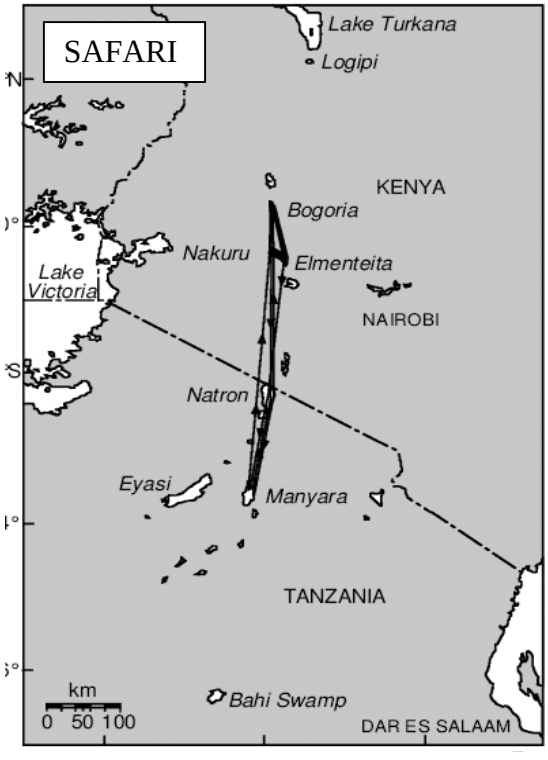
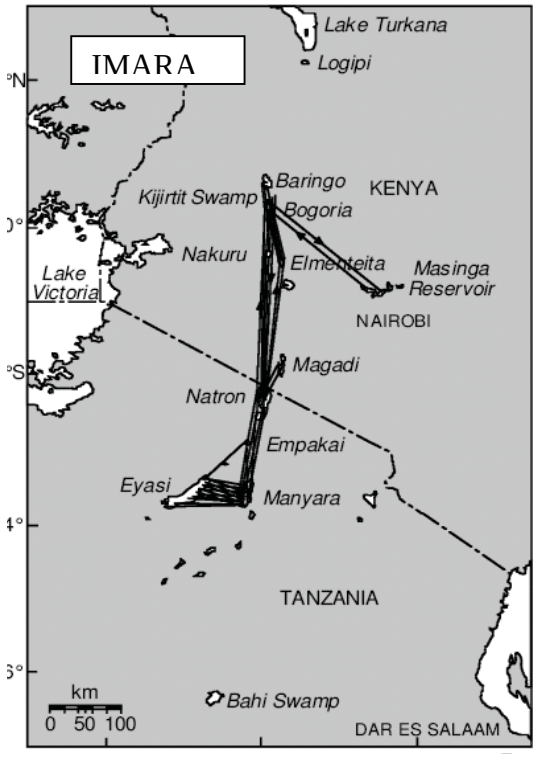
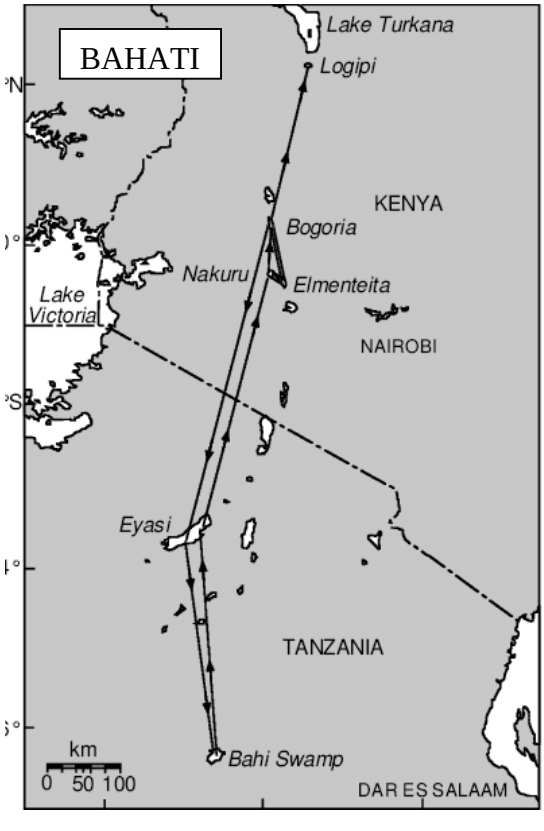


Figure 4:

Migratory Movements of Individual Lesser Flamingos, Marked at L. Bogoria and Satellite Tracked for 9 Months (October 2002 and July 2003).
(Source: Childress et al, 2004)







SAFARI: *During the nine-month study, Safari made 16 inter-lake flights, visited five different lakes, spending a mean 16 days at each stop and travelling 1,866 km.*

BAHATI: *During nine months, Bahati made 12 inter-lake flights, visited six different lakes and wetlands, spent an average 20.9 days at each stop, and travelled a total of 1,917 km.*

IMARA: *During the first 101 days, Imara travelled 4,792km, moving among nine different lakes 44 times. Spent an average at each lake of only 2.3 days. Following this initial period of frenetic activity, Imara seemed to settle and spend much longer periods each stop. During the remaining 171 days, travelled 1,307km moving among six different sites 15 times, spending an average 11.4 days. Overall, he visited 11 different lakes and wetlands, many several times, extending from Lake Baringo in Kenya and Lake Eyasi in Tanzania (a distance of 500km). In total, the inter-lake flights covered 6 099 km.*

Figure 5:

Seasonal Trends in Lesser Flamingo Numbers in Lake Manyara, Tanzania
(Source: Kihwele, 2009)

Month	Number of Flamingo	Standard Error of the Mean
July	12,541	1,412.64
August	9,319	512.58
September	14,574	731
October	46,712	308.3
November	70,392	6,239.20
December	35,206	245
January	203,577	7,685
February	216,705	7,820.74
March	322,335	24,826
April		
May	454,420	15,316.94
June	515,777	18,599.53
July	354,834	7,653.98
August	640,850	25,526.55

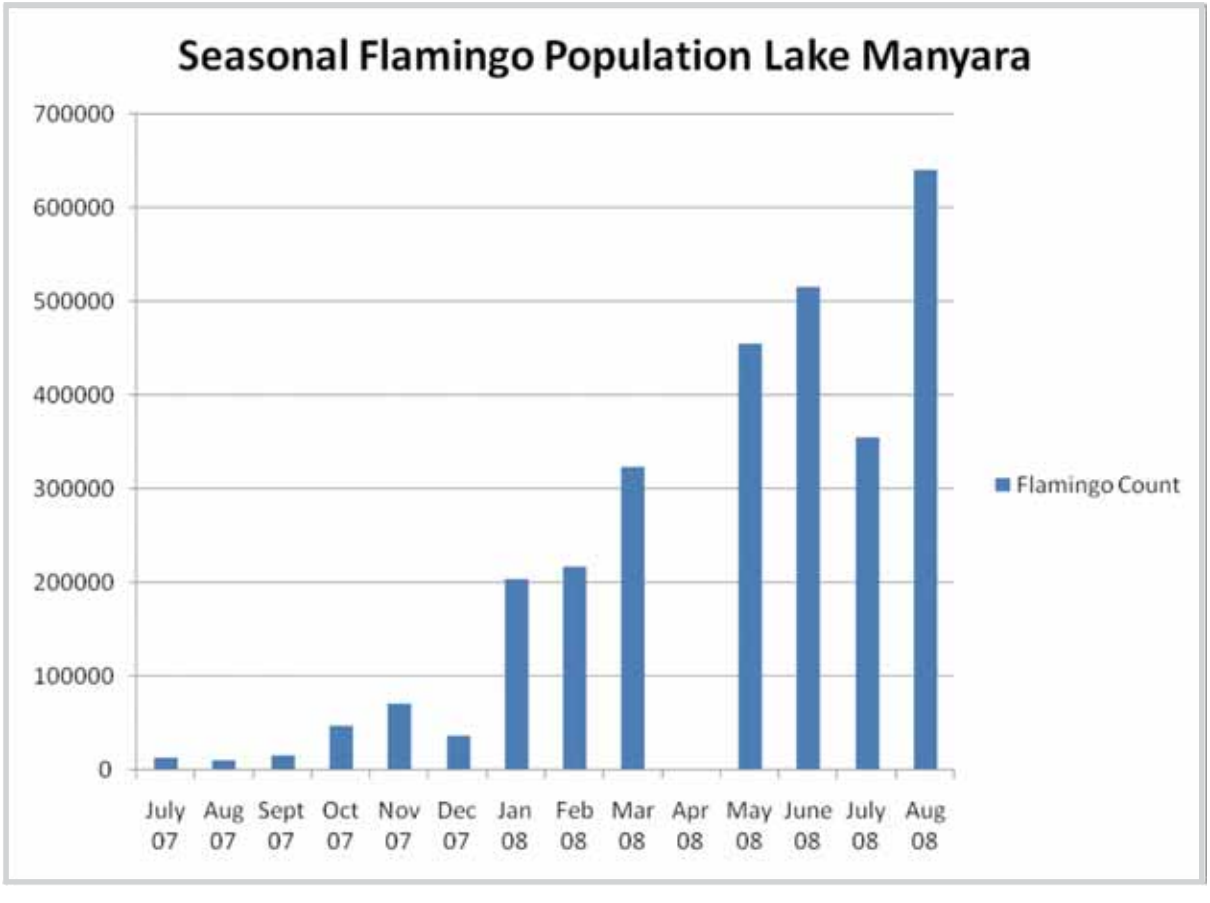
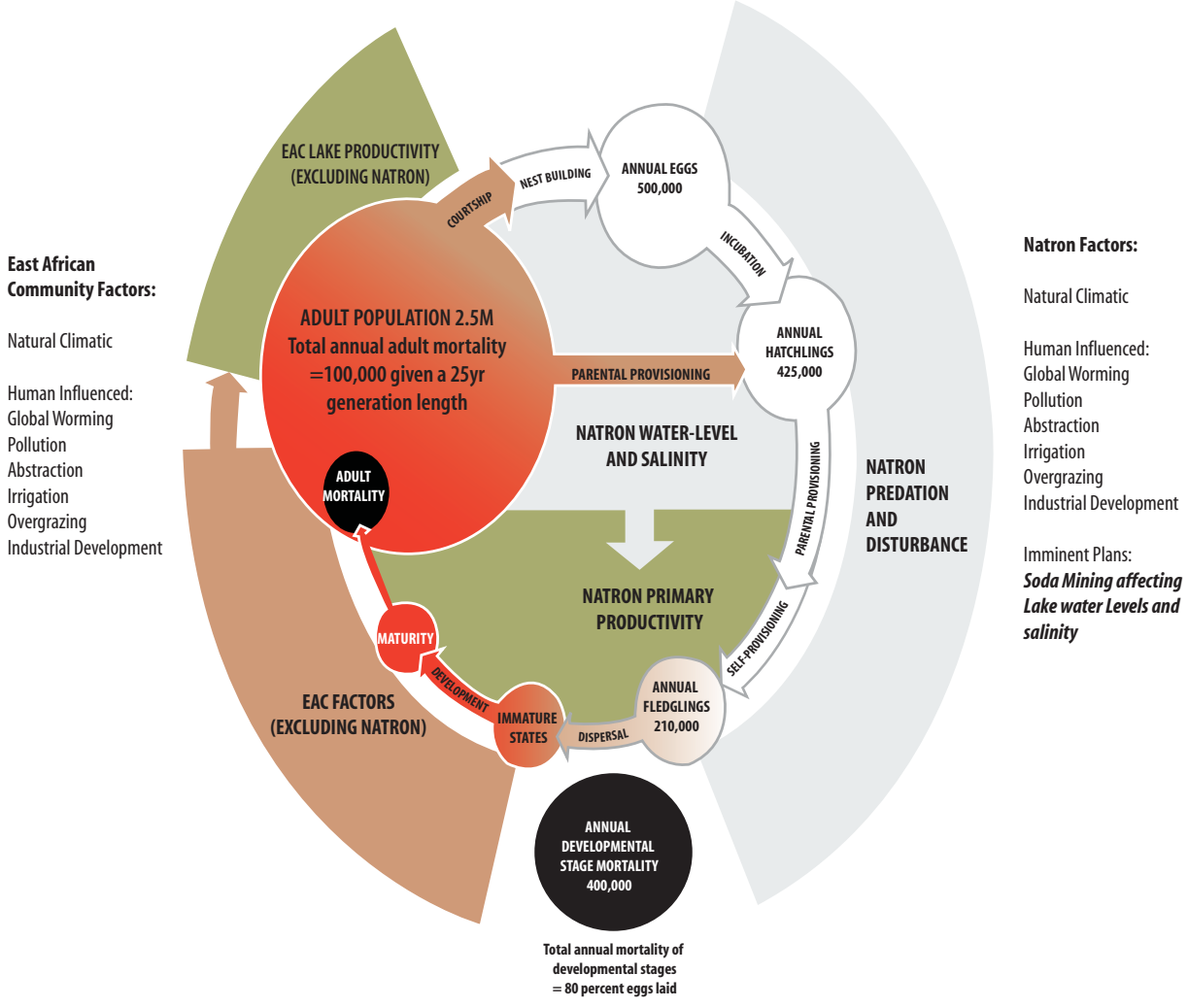


Figure 6:

Threats to Survival During Lesser Flamingo Life Cycle in E. Africa/Natron
(Disneynature, 2008)

LESSER FLAMINGO SURVIVAL IN EAST AFRICA- A DELICATE EQUILIBRIUM

Figure based on assumptions of Root & Brown 1971 with modifications



TABLES

Tanzania National Single Species Action Plan 2010-2020 for the Conservation of the Lesser Flamingo (Phoeniconaias minor)

Table 1:

A Composite of Counts of Non-breeding Lesser Flamingo From Regional Sub-population Estimates (2003-2007)

(Source: Modified from AEWA/CMS, 2005 SSAP Lesser Flamingo)

Sub-population By Region	Lowest Number Count	Highest Number Count
1. East Africa Region:		
Ethiopia	3,270	24,000
Kenya	79,620	1,452,500
Tanzania *	549,330	633,215
Uganda	45	62,790
Total E. Africa Population	**832,265**	**2,172,505**
%	**95.9**	**79.9**
2. West Africa Region:		
Guinea	11125	13000
Guinea-Bissau	160	2000
Mauritania	160	4800
Senegal	15	4360
Total W. Africa Population	**11460**	**24160**
%	**1.3**	**0.9**
3. South Africa Region:		
Botswana	20	410
Namibia	5470	55995
South Africa	1795	55550
Total S. Africa Population	**7285**	**111955**
%	**0.8**	**4.1**
4. India Region:		
India	17045	411360
Total India Population	**17045**	**411360**
%	**2.0**	**15.1**
Global Total:	**868 055**	**2 719 980**

**Tanzania estimates are higher and recent data is presented in Table 3.*

Table 2a. Numbers of flamingoes on Rift Valley Lakes 1974-76 with comparative Figures for march 1969

Location/Lake	Aug./Sept. 1974	Dec. 1974	Feb. 1975	Aug. 1975	Jan. 1976	Mar. 1969
Ferguson's Gulf	120 360 ±26 256		22 790 ±4525	24 930 ±5247	30 331 ±7296	
Crocodile Pools/ Odoch			2542†	12 800†	1701‡	
Central Island	250*		15 410 ±3119	18 894†	26 025 ±12 043	
Rudolf/Turkhana	7190*					
Logipi/Suguta	78 490 ±19 094		82 350 ±22 938	173 700 ±29 958	233 270 ±71 762	
Hannington/ Bogoria	5840 ±2485		500*	500*	2000*	634 056
Nakuru	25 320 ±3723	13 040 ±2557	6480 ±1465	12 130 ±3328	3877 ±1206	314 982
Elmenteita	36 330 ±7946	15 000*	25 450 ±5358	15 911 ±3775	43 990 ±11 491	
Magadi	62 924 ±14 011		25 000*	8470 ±2175	29 940 ±7297	6580
Natron	29 670 ±4796		56 490 ±9676	112 940 ±27 291	48 710 ±10 966	25 195
Manyara	48 265 ±13 203		63 740 ±21 362	41 230 ±8 673	71 400 ±14 114	
Empaakai Crater	700*					
Eyasi	1000*		35 438 ±6475	2000*	25 820 ±5500	28 288
Engaruka	1000*				0	3429
Balangida & Balangida Lelu	236*				0	16 811
Ndutu	2000*		200*	2000*	0	
Basuti	56*				0	54
Momella	10 040 ±5290		43 990 ±11 791	19 201†	23 645 ±4380	25
Babati	0				0	0
Kitangiri	2480		500*	10 390 ±2167	0	104
Burungi	0				0	0
Ngorongoro	0		0	44*	15*	5686

* Visual counts/estimates made from the air.
† Total counts from aerial photographs.

Table 2b. Total numbers of lesser flamingoes in Kenya and northern Tanzania Rift Valley

Date	Total from aerial photographs	95% confidence limits	Total from direct counts	Total estimate
Aug./Sept. 1974	419 719	±96 804	12 432	432 151
Feb. 1975	354 680	±86 709	26 200	380 880
Aug. 1975	450 596	±82 614	4544	455 140
Jan. 1976	538 709	±146 055	2015	540 724
March 1969*	1 043 816	–	–	1 043 816

* Data from Bartholomew & Pennycuick (1973).

Table 3:

Composite Counts Showing Extreme Estimates of Lesser Flamingo in Major Sites in Tanzania: (1960- to-date)

Site	Protection status	Highest Number Count	Lowest Number Count
Lake Natron (154 000 ha)	Both a Ramsar site and IBA. IMP under preparation. On way to become a WMA, under 2 districts. Is the only breeding site of the E Africa sub-population.	1 080 000 *(Watts 1991)*	5 000 *(AEWA Jan 2010)*
Lake Manyara (413 000 ha)	This lake, 1/3 is unprotected, 2/3 is within Manyara NP, and a Biosphere Reserve. Considered a potential Ramsar site and is an IBA.	1 900 000 *(1995)*	0 *(AEWA Nov 2009)*
Lake Eyasi (116 000 ha)	Unprotected. Its north-western shoreline borders the Ngorongoro Conservation Area (NCA). It is being considered as a Ramsar site and is an IBA.	700 000	Unknown
Lake Magadi (Makat) (2000 ha)	Fully protected within the NCA. It is a designated IBA.	1 200 000	0
Lake Empakai (1500 ha)	As above. A seasonally vital feeding area for Lake Natron breeding. Key feeding site end of the dry season when water in other lakes are at their lowest.		
Momella Lakes (1000 ha)	Protected inside Arusha NP. 50% of NE shoreline of Big Momella is unprotected. It is a designated IBA.	220 000	2 000
Lake Ndutu (Lagarja)(1000 ha)	Is protected in Serengeti NP and NCA. It is a designated IBA.	150 000	0
Lake Burungi (4000 ha)	Falls outside Tarangiri NP. Within Burunge WMA. It is a designated IBA. Freshwater.	34 000	0
Singida Lakes (1100 ha)	Unprotected. It is a designated IBA. Includes Kindai and Singidani lakes.	55 000	0
Lake Engaruka (400 ha)	Unprotected. It is a designated IBA.	3 400	0
Lake Kitangiri	Unprotected. It is a designated IBA.	357 000	Unknown
Bahi Swamps	Unprotected. Qualifies, but not yet a designated IBA.	20 000	0
Lake Balangida Lelu (13 000 ha)	Unprotected. It is a designated IBA.	23 100	2 000
Lake Rukwa (600 000 ha)	Largely unprotected. A portion is in Rukwa-Lukwati Game Reserve. It is a designated IBA.	1000's	0 *(PM Obs 2010)*
Lake Lukuuga	Unprotected. Young birds have been noted.	290	0
Saadani Salt Works (1000 ha)	Unprotected. Man-made wetlands.	2 500	0
Lake Tlawi (5 ha)	Unprotected. Birds migrate in season.	5 -10 000	0
Lake Babati (1000 ha)	Unprotected. Within Babati township. Freshwater. LF seen in dry season.	100's	0
Lake Basuto (100 ha)	Unprotected.	1000	0

**Lakes with over 20 000 birds are considered key, priority sites.*

***Sampling methods vary and this can give rise to the variations in ranges above.*

(Source: Modified by workshop, from Baker and Baker, 2002 and Mlingwa and Baker, 2006)

Table 4:

Composite Count Showing Extreme Estimates of Lesser Flamingo in Major Sites in Kenya (1950s' to date)

Site	Protection status	Max number	Min number
Lake Nakuru	This lake is protected within the Lake Nakuru National Park. It is designated both as a Ramsar site and IBA.	1 893 500	1 135
Lake Sonachi	This small lake is unprotected, but enclosed within privately owned land. It is within Lake Naivasha Ramsar site and IBA boundaries.	2 750	20
Lake Bogoria	This lake is protected within Lake Bogoria National Reserve. It is designated both as a Ramsar site and IBA. Attempted breeding has been recorded in 1979/80.	1 350 695	14,645
Lake Elementeita	This lake is unprotected with a large area of its shore adjacent to privately owned land and the rest to community land. It is a designated Ramsar site.	588 375	710
Lake Logipi	Unprotected. Breeding of 1 million pairs was recorded in 1978.	500 000 - 2 000 000	?
Lake Oloidien	It is unprotected with a small part of shoreline adjacent to public land, while the rest to private land. Enclosed within Lake Naivasha Ramsar site and IBA boundaries.	350 535	5
Lake Magadi	Is unprotected and privately owned. It is a designated IBA. Known to have breed here in 1962, over 1 million pairs, and 1978.	40 000 – 2 000 000	2 120
Lake Solai	Unprotected.	6 865	1
Lake Turkana	Largely unprotected, with a small area inside the Sibiloi National park. It is a designated IBA. Reported to have breed here once in 1957, 30-40 000 pairs.	5 000 - 80 000	5 000
Sabaki River mouth	Unprotected. It is a designated IBA.	2 600	15

**The significance of this is that these are the same flock shared with Tanzania, as they cover an extended range.*

Source: National Museums of Kenya, Ornithology Section: Waterbird Census reports and Kenya LF SSAP (2008).

Table 5:

Lesser Flamingo Breeding Observations, Global: 1954-89.

(Source: Kobb, 2000)

Year	Month	Region	Site	Pairs Breeding	Source	Comment
1954	6-8	Tanzania	Natron	100,000-150,000	B 1955	
1955	2	Zambia	Mweru/Wantipa	630	H Dick Brown	Probably destroyed by rising water
1955		Tanzania	Natron	0	B&R 1971	
1956	3	Tanzania	Natron	30,000-40,000	B&R 1971	
1957	6	Kenya	Turkana	30,000	B&R 1971	Unclear if successful
1957	10-12	Tanzania	Natron	570,000	B&R 1971	
1958	10-12	Tanzania	Natron	?	B&R 1971	Very large colonies, not counted
1959	2	Tanzania	Natron	26,000-32,000	B&R 1971	Successful?
1959	11-12	Tanzania	Natron	15,000	B&R 1971	+/- 200,000 drop eggs on mudflat
1960	11-12	Tanzania	Natron	300,000	B&R 1971	Continued to Jan 1961
1961		Tanzania	Natron	0	B&R 1971	No breeding, heavy rain
1962	7-10	Kenya	Magadi	1,100,000	B&R 1971	First breeding at Magadi in Century
1962-3		Tanzania	Natron	0	B&R 1971	No breeding, high water level
1963		Kenya	Magadi	0	B&R 1971	Nests made but no laying
1964		Tanzania	Natron	0	B&R 1971	Too flooded
1964		Kenya	Magadi	0	B&R 1971	No breeding but flying young seen
1965	7	Mauritania	Aftout	800-900	Nauroius 1969	
1965	10-11	Tanzania	Natron	Ns	B&R 1971	Breeding on small scale
1966	10-11	Tanzania	Natron	Ns	B&R 1971	Breeding on small scale
1967	10-11	Tanzania	Natron	Ns	B&R 1971	Breeding on small scale
1971	5-8	Namibia	Etosha	54000	Berry 1972	
1973	12	India	Kutch	1,000-2,500		
1974	2-4	Namibia	Etosha	6800	Kahl 1975	
1977		Tanzania	Natron	?	D. Turner	Breeding takes place
1978	6	Botswana	Sua Pan = Makgadikgadi	787	R & J 1979	Unknown outcome
1978		Kenya	Logopi	1,000,000	D. Turner	
1978		Kenya	Magadi	+1,000	D. Turner	
1979		Kenya	Bogoria	?	D. Turner	Attempts unsuccessful
1980		Kenya	Bogoria	0	D. Turner	Heavy rains interfere
1984	4-6	Tanzania	Natron	Ns	D. Turner	Large success but no count
1989		Tanzania	Natron	0	D. Turner	No breeding

Summary of Breeding Observations:

Total Observations	Observations	% of Total
Total Observations	31	
Unsuccessful Breeding	8	26%
Successful Breeding	23	74%

Successful Breeding	Observations	% of successes	Pairs Observed	% of Birds
Natron (Tanzania)	13	56.5%	1,073,000	32.8%
Magadi (Kenya)	2	8.7%	1,101,000	33.7%
Etosha (Namibia)	2	8.7%	60,800	1.9%
Turkana (Kenya)	1	4.3%	30,000	0.9%
Sua Pan (Botswana)	1	4.3%	787	<0.01%
Mweru Wantipa (Zambia)	1	4.3%	630	<0.01%
Logopi (Kenya)	1	4.3%	1,000,000	30.6%
Kutch (India)	1	4.3%	1,250	<0.01%
Aftout (Mauritania)	1	4.3%	850	<0.01%
Total	23		3,268,317	

Table 6:

Breeding Observation of Lesser Flamingo at Lake Natron: 1991

(Source: Watson's 1991 detailed data in Kobb 1999) (location by %s)

Lagoon Name	Adults	%	Chicks	%	Nests	%	Abandoned Nests	%	Isolated Nests	%	Unoccupied Nests	%	Nests in Strings	%	Nests in Prep in Strings	%
Losedeti	375	0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
Northwest	40	0.0%		0.0%		0.0%	-	0.0%		0.0%		0.0%		0.0%		0.0%
N. Humbu	5,115	0.5%		0.0%		0.0%	661,850	100.0%		0.0%		0.0%		0.0%		0.0%
Peninj	10,184	0.9%	4,330	2.5%		0.0%		0.0%	380	8.2%		0.0%		0.0%		0.0%
S. Humbu	4,523	0.4%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
West	12,363	1.1%		0.0%		0.0%		0.0%	71	1.5%		0.0%		0.0%		0.0%
Southern	868,421	80.4%	140,163	81.8%	252,348	100.0%		0.0%	3,841	82.7%	48,252	96.6%	108,543	100.0%	49,500	100.0%
Un-named		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
Un-named		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
Un-named		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
Un-named		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
Gelai	5,529	0.5%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
East	10,655	1.0%	218	0.1%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
Unnamed		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
North East	3,288	0.3%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
Un-named		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
Mukoyo	53,565	5.0%	26,629	15.5%		0.0%		0.0%	350	7.5%		0.0%		0.0%		0.0%
Un-named		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
Un-named	1,816	0.2%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
Un-named		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
E. Ngiro	104,765	9.7%		0.0%		0.0%		0.0%		0.0%	1,680	3.4%		0.0%		0.0%
Unnamed		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%
Totals DK	1,080,639	100.0%	171,340	100.0%	252,348	100.0%	661,850	100.0%	4,642	100.0%	49,932	100.0%	108,543	100.0%	49,500	100.0%
Totals W	1,080,579		171,340		252,348		661,850		4,631		49,932		108,543		49,500	

Totals DK = our totals, totals by W = those by the original author (Watson)

Table 7:

Problem Tree, Threat Importance Ranking For Lesser Flamingo in Tanzanian Key Water Bodies *(Based on AEWA Matrix)*.

Species level import-ance	Primary threat	Sub-threat	Sub-threat	Sub-threat	Sub-threat	Sub-threat	Burungi	Balangida Lalu	Bahi	Empakai	Eyasi	Ndutu/Lagarja	Natron	Momella	Manyara	Magadi (NCA)	Rukwa Lake	Singida Lake	Tanzania Gen)
1	**Habitat loss and/or Degradation**	Altered hydro-logy and/or water quality	Reduced water flow	Inappropriate catchment management	Water management	Drainage for agricultural land			4										4
						Drainage for roads, buildings & infrastructure													4
						Reservoir creation													
						Dams in catchment							?k						
						Canalization of rivers							?k						
						Diversion of rivers							?k						
						Abstraction for human use	?								3				
						Abstraction for irrigation	3		3		3		3		3				3
					Reduced runoff	Reforestation													
					Increased flooding and sedimentation	Deforestation & bushfires	5	3	3	5	3		3	3	3		5	?	4
						Over-grazing	3	2	4		2		2	4	3		3		3
						Arable farming on steep slopes					3		4	4	3		4		4
			Increased drought	Climate change			3	3	3	4	3	3	2	3	2	3		3	3
			Wetland Pollution	Fertilizer & Pesticides				?	4		3		4	4	2		4	?	4
				Industrial chemicals														5	
				Sewage							?		?		4			4	
				Heavy metals															
				Oil															
		Extraction	Salt / minerals						?				1?		5		3?		1?
			Oil & gas																
		Expansion of macrophytes	Fertilizers					5	5						4			5?	
		Conflict with other conservation																	
		Roads, buildings, other infrastructure																3	3
		Invasive plants (eg. Typha)													5				

Species level import-ance	Primary threat	Sub-threat	Sub-threat	Sub-threat	Sub-threat	Sub-threat	Burungi	Balangida Lalu	Bahi	Empakai	Eyasi	Ndutu/Lagarja	Natron	Momella	Manyara	Magadi (NCA)	Rukwa Lake	Singida Lake	Tanzania Gen)
Species level import-ance	Primary threat	Sub-threat	Sub-threat	Sub-threat	Sub-threat	Sub-threat	Burungi	Balangida Lalu	Bahi	Empakai	Eyasi	Ndutu/Lagarja	Natron	Momella	Manyara	Magadi (NCA)	Rukwa Lake	Singida Lake	Tanzania (Gen)
2	**Disruption of Nesting Colonies**	Human	Fishermen																
			Salt worker																
			Nearby settlements																
			Military exercises																
			Hunting other species																
			Pastoralists																
			Low-flying aircraft	Tourists									5						
				Film crews									5						
			Photographers										?						
		Predators	Terrestrial										4						
			Avian										3						4
2	**Toxicological Diseases**	Heavy metals																	
		Agro-chemicals					4	5			3		3	4	1				3
		Domestic waste					4	5			5		5	5	4			5	5
		Industry chemicals																	
		Botulism																	
		Cyanobacterial toxins	Fertilizer eutrophication	Climate Change							5		5	5	4		?	?	5
2	**Infectious Diseases**	Avian influenza																	
		Avian cholera													?				
		Avian tuberculosis																	
		Salmonella																	
		Pseudomonas																	
5	**Harvesting**	Illegal hunting	Subsistence																
		Wild bird trade	Zoo/Tourism				5	5	5		5	5	5		5		5	5	5
		Egg harvesting	Human Food																
5	**Human Disturbance at Non-Breeding Sites**	Boating													5				
		Fishing					5		5		5				5		4		4
		Hunting other sps																	4
		Tourists										5							4
		Planes/ Helicopters																	4
		Birdwatchers																	4
		Photographers																	4
		Military exercises																	
5	**Predation**	Baboons					5							5	5	5			
		Birds of prey								5			3	5	5	5			
		Marabou Storks					4						2	?	4				4
		Hyenas/Jackals					5	5						5	5	5			
		Feral dogs												?					

Species level import-ance	Primary threat	Sub-threat	Sub-threat	Sub-threat	Sub-threat	Sub-threat	Burungi	Balangida Lalu	Bahi	Empakai	Eyasi	Ndutu/Lagarja	Natron	Momella	Manyara	Magadi (NCA)	Rukwa Lake	Singida Lake	Tanzania Gen)
Species level import-ance	Primary threat	Sub-threat	Sub-threat	Sub-threat	Sub-threat	Sub-threat	Burunge	Balangida Lelu	Bahi	Empakai	Eyasi	Ndutu/Lagarja	Natron	Momella	Manyara	Magadi (NCA)	Rukwa Lake	Singida Lake	Tanzania (Gen)
5	Competition	For food	Fish				5	5					5						
			Crustaceans										?						
		For breeding sites	Terns																
			Pelicans																
			Cormorants																
			Gulls																
5	Collision with Man-Made Structures	Power lines					?		?						?				
		Wind Turbine						?	?									?	
		Telephone lines							?										
		Fences																	
		Light masts																	
		Guide wires																	

Key to Rankings:

1. Critical: A factor causing or likely to cause very rapid declines (>30% over 10 years);
2. High: A factor causing or likely to cause rapid declines (20-30% over 10 years);
3. Medium: A factor causing or likely to cause relatively slow, but significant, declines (10-20% over 10 years);
4. Low: A factor causing or likely to cause fluctuations;
5. Local: A factor causing or likely to cause negligible declines;
?. Unknown: A factor that is likely to affect the species but it is not known to what extent;
Blank space: Factor does not apply in this country.
k: Factor applies to Kenya population.

Modified by workshop and adapted from Childress, B., Nagy, S. and Hughes, B. (Compilers). 2008. International Single Species Action Plan for the Conservation of the Lesser Flamingo (Phoeniconaias minor). AEWA Technical Series No. --. Bonn, Germany.

Table 8:

Examples of Major International Conventions and Agreements of Relevance to the Lesser Flamingo, and Ratified by Tanzania

Convention/ Agreement	Listing of Lesser Flamingo, its sites or habitat	Obligations (with Relevance to Lesser Flamingo)	Focal point/ Responsible institution
Convention on the conservation of Migratory Species of Wild Animals (CMS) (Bonn Convention)	Appendix II	For migratory species that have an unfavourable conservation status or would benefit significantly from international co-operation. The Convention encourages the Range States to global or regional sign agreements for the conservation and management of individual species or, more often, of a group of species listed on Appendix II.	WD
African-Eurasian Migratory Waterbird Agreement (AEWA)	Annex II of this agreement, and Columns A and B of the AEWA 2006-2008 Action Plan. Several IBAs are LF sites.	(a) To conserve, & where feasible and appropriate, restore those habitats of the species which are of importance, removing the species from danger of extinction; (b) To prevent, remove, compensate for, or minimize, as appropriate, the adverse effects of activities or obstacles that seriously impede or prevent the migration of the species; and (c) To prevent, reduce or control factors that are endangering or are likely to further endanger the species, including strictly controlling the introduction of, or controlling or eliminating, already introduced exotic species.	WD
Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	Appendix II (Tanzania is permitted to trade)	Trade in Lesser Flamingo specimens requires the prior granting and presentation of an export permit. Tanzania has CITES quota of 1600 LF/year. An export permit is only granted when the following conditions are met: (a) A Scientific Authority of the State of export has advised that such export will not be detrimental to the survival of that species; (b) The Management Authority of the State of export is satisfied that the specimen was not obtained in contravention of the laws of that State, and (c) A Management Authority of the State of export is satisfied that any living specimen will be so prepared and shipped as to minimize the risk of injury, damage to health or cruel treatment.	WD
Ramsar Convention on Wetlands	Only 1 site listed as RAMSAR site for the protection of Lesser Flamingo: Natron.	Convention provides the framework for the conservation and wise use of wetlands and their resources of global importance through local, regional and national actions and international cooperation. A Contracting Party, is required to designate at least one wetland within its territory for inclusion in a List of Wetlands of International Importance maintained by the Ramsar bureau.	WD
Algiers Convention	General agreement that seeks to preserve habitats.	A contracting party is obliged to ensure conservation, rational use and development of soil, water, floral and faunal resources. The objectives of this convention are provided for, though not fully, by the Forestry and the Wildlife Acts.	WD

Convention/ Agreement	Listing of Lesser Flamingo, its sites or habitat	Obligations (with Relevance to Lesser Flamingo)	Focal point/ Responsible institution
Convention on Biological Diversity (CBD)	This is a broad convention that include all sites and habitats of the Lesser Flamingo	A contracting party has the responsibility to conserve biological diversity. To use biological resources sustainably. Required is contracting parties anticipate, prevent and address causes of reduction or loss of biological diversity. It notes that the fundamental requirement for conservation of biological diversity is *in situ* conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings.	WD
The World Heritage Convention	Serengeti National Park and Ngorongoro Conservation are key to Lesser Flamingo	This convention focuses on the conservation of areas that are of outstanding global cultural or natural value. Several of the Rift Valley lakes (Magadi, Empakai and Ndutu) are currently listed as part of World Heritage sites on account of their natural and cultural attributes.	WD
UNESCO's Man and Biosphere Programme	Manyara NP	This UNESCO programme, encourages biosphere reserves, initiated with the aim of developing rational use and conservation of resources. Biosphere reserves are areas of terrestrial and coastal ecosystems, which are internationally recognized within the framework of UNESCO's programme.	WD

Table 9:

Examples Of National Laws And Policies Affecting Conservation Of Lesser Flamingo In Tanzania.

Law or Policy	Relevance	Responsibility
Environmental Management Act (EMA) 2004.	EMA makes provision for declaration of any sensitive area of wetland to be a protected reserve. This can be usefully applied in the protection of LF habitats, supported by new Wildlife Act. EMA provides for a mandatory State of the Environment Report (SOER) for wetlands and an EIA for new projects. Calls for regular environmental audit of existing projects. The Act has provisions to ensure that planned and ongoing development projects will not have adverse effects on biodiversity and environment quality. Restricts permanent structures within 60 m of wetlands. Requires wetlands are included in Environmental Action Plans (EAP), part of the District Development Plans (DDP).	NEMC, VPO, WD
Public Health Act,	Provides regulations for proper waste disposal and waste management, to maintain healthy environment. Applicable to flamingo habitats threatened by pollution.	Ministry of Health; Local Authorities
The Wildlife (Conservation and Management) Act, (2009)	The new Act provides for the creation of conservation areas (eg wetlands reserves, wetland areas and WMAs) for the preservation of key habitats and their biodiversity. Lesser Flamingos and their habitats can benefit from such conservation measures provided by the Act (eg Natron is under process towards a WMA).	WD
The Water Act (2004).	The Act provides for the conservation, control, apportionment and sustainable use of water resources. Provisions of the Act can be applied for the protection of fragile water resources and related environments that include Lesser Flamingo habitats.	Ministry of Water, Water Authorities
The Agriculture Act	This Act provides for sustainable agricultural practices, pollution control, and conservation of soil and water resources. By encouraging the protection of fragile land including riverine habitats and water catchment through application of sustainable agricultural practices, silt loading into flamingo habitats from erosive activities can be reduced.	Ministry of Agriculture
Irrigation Policy (2008)	Encourages expansion of irrigation as a means to overcome poverty reduction and for food security. However, this could lead to competition for water in LF catchments.	Ministry of Agriculture.
The Forest Act, 2006	The Act provides for the participatory management, protection, conservation, control and regulation of plantation and indigenous forests. Provisions against soil erosion and introduction of alien species can contribute to protection of Lesser Flamingo habitats (eg deforestation in Natron catchment).	Ministry Natural Resources and Tourism.
The Village Land Act, 1999	The Act provides for the development of land use plans for villages taking into consideration the protection and conservation of critical natural resources within a drainage area such as the Lesser Flamingo habitats.	Ministry of Land,

Law or Policy	Relevance	Responsibility
The Local Government Act (1994)	The Act empowers local authorities to establish and maintain conservation areas, make by laws, take measures necessary for proper district and urban development planning. The aim is sustainable natural resource use in their areas of jurisdiction. Councils can invoke this Act to conserve critical habitats like those of the Lesser Flamingos.	Local Authorities
The East African Community Treaty (1999)	Articles 111-116 provide for the cooperation in the conservation and management of natural resources, trans-boundary pollution control and the coordinated conservation and sustainable utilization of wildlife and other tourist sites in the region though harmonization of policies. These provisions can allow for formulation region wide conservation strategies of the of the migratory Lesser Flamingos	Ministry of East African Cooperation
Physical Planning Act	Local authority has powers in planning and granting approvals for development applications, to undertake EIAs and enforcement of planning laws. Local authorities manage the village based and some national reserves (eg forests, WMAs, etc), maintain land planned for open spaces, parks, urban forests, and green belts in accordance with the approved physical development plan. An EIA must be submitted for any development application which may impact on the environment.	Local Authorities
Dar Declaration on Food Security (2004)	Advocates for cooperation in SADC region for food production, all the while paying consideration to natural resource management. Can be used to coordinate developments between Kenya and Tanzania on lake Natron.	Ministry of Agriculture

Table 10:

Stakeholders And Their Impacts (May Be Positive Or Negative) On Lesser Flamingo And Their Key Habitats In Tanzania

Stakeholder group	Region/site	Activities	Impact (-ve)	Impact (+ve)
a. Private Sector/Community				
Soda mining companies	Lake Natron	Soda ash extraction and water abstraction changes hydro-chemistry. Factory disturbance.	*****	
Hotels and Lodges	Countrywide	Sewage, waste discharge & water abstraction, tourist disturbance of breeding sites.	*	
Hydro-electric Schemes	Catchment & Kenya	Damming catchment water for HEP generation can change river flows affecting water cycle and feeding and breeding conditions	*****	
Farmers and pastoralists communities	Countrywide and WMAs	Water abstraction, overgrazing or encroachment or catchment irrigation or burning, or expansion of catchment farm land, leading to land degradation, waste/pesticide discharge, river drying and/or flash flooding and river siltation.	****	
Large Scale Irrigation	Catchment and Kenya	Overuse of water in catchments for large scale irrigation can reduce environmental flows and affect seasonal water cycles in feeding and breeding key sites.	*****	
Saw millers, timber processors and charcoal makers.	Key Catchments	Deforestation, altered river or hot spring flow regime and increased siltation. Loss in forest changes local rainfall patterns.	****	
Urban settlement and related infrastructure development	Key Catchments	Noise & air pollution, water abstraction and diversion, waste discharge & increased run-off leading to siltation, power structure affect flyways. Waste dumps attract marabous.	**	
Water and sewerage service providers- towns	Countrywide	Water abstraction and diversion, waste discharge leading to water pollution.	***	
Saadani Salt Works	Saadani NP	Created man-made environment for LF. Nesting of Greater Flamingo observed.		***
Industries and factories	Key catchments	Water abstraction & chemical pollution.	**	
Tour and hunting operators	Key catchments or GCAs	Habitat modification, stress, noise, aircraft over-flight disturbance, encroachment, but also through local anti-poaching and CBNRM protect key sites (eg Natron).	*	**
b. Institutions:				
UNEP, IUCN, World Bank & Development Partners	Countrywide	Biodiversity conservation and sustainable development efforts.		**
Wildlife Protected Areas and National Parks	Ngorongoro Conservation Area, Serengeti NP, Manyara NP, Arusha NP.	Provide protection to habitats for biodiversity conservation, including LF.		**
AEWA NGOs: BirdLife, RSPB & Wetland International	Countrywide	Monitoring biodiversity status and associated environmental changes, anti-lobby to site exploitation. Establish and monitor IBAs and seek resources to protect and manage key sites (eg Natron Project)		****

Stakeholder group	Region/site	Activities	Impact (-ve)	Impact (+ve)
Universities: SUA, UDSM, ARDHI, etc.	Countrywide	Basic and applied research: conservation, land-use practices, capacity building, sources of information. Mortality studies. Linked with Leicester University study on Natron.		***
Polytechnics and other tertiary institutions (eg Mweka)	Local	Capacity building and research on zoonotic diseases.		**
Regional and LGA Administration	Country wide	Enforcing regulations on environmental protection and conservation, inclusion in DDP and actions through CBNRM projects (eg Natron).		***
Ministries of Agriculture & Livestock Dev. and Fisheries	Countrywide	Sustainable farming and fishing practices that do not impinge on lesser flamingo, or its catchment. However, can experience conflict over catchment water use for irrigation, pastoralism and fishing in key sites.	***	***
Ministry of Environment and NEMC	Countrywide	Environment protection and conservation applying EMA to mandate SOER of wetlands, to include wetlands in DDP/EAP, to create wetland reserves and monitoring EIAs on new investments (eg ESIA of soda plant Lake Natron).		*****
Ministry of Water (and Irrigation)	Countrywide	Water catchment conservation, but can come in conflict due to competing water use for domestic or irrigation needs in key sites.	****	****
Ministry of PMO-RALG.	Countrywide	Natural resources management guiding LGA in Urban and rural land-use planning, and inclusion of CBNRM in DDPs.		****
Ministry of Education	Countrywide	Increasing awareness and information dissemination through schools, and wildlife clubs (eg WCST and MCT).		****
Ministry of NR and Tourism	Countrywide	Biodiversity conservation and ecotourism and custodian of wildlife and wetlands through network of PA (ie GR, GCA, WMA, etc) and through Ramsar convention, manage key sites (eg Lake Natron).		*****
Ministry of Lands & Settlement	Countrywide	Land use planning and management allow for holistic planning by communities.		****
Local Environmental NGOs (WCST, MCT)	National	Biodiversity conservation and advocacy and CEPA including wildlife clubs (eg Natron)		*****
International Conservation NGOs (WWF, WCS, FZS, AWF, BirdLife, etc	Countrywide	Biodiversity conservation, improved livelihood, policy formulation and advocacy and research, and CBNRM (eg AWF assisting WMA in Natron).		*****
Development NGOs (OXFAM, CARE, etc)	Countrywide	In interest of assisting poverty reduction (like catchment irrigation or pastoralism) can come into conflict with water use affecting downstream LF lakes (eg Natron & OXFAM).	****	

Key: *Low; **Medium; ***High; ****Very High

Table 11:

Existing Projects, Which Are Relevant To Lesser Flamingo Conservation

There are several on-going conservation and development projects that are currently being implemented by diverse organizations within the watersheds of Lesser Flamingo habitats of Kenya and Tanzania, which could have direct impact on the species. Examples of such projects are listed below:

a. Environmental Projects

On Going Projects	Responsible/Contacts
Mapping of IBAs and bird counts	TBAP and NWWG AEWA SC.
Avian Influenza Surveillance amongst the wild birds	TBAP, Director of Veterinary Services. Ministry of Livestock and Fisheries.
Sustainable Wetlands Management Program, Lake Natron Component supported by Danida.	Wildlife Division, Wetlands Unit and Arusha RS, Longido and Ngorongoro DC.
Wings Over Wetlands Project	AEWA/GEF, BirdLife, Wetlands International and WCST.
Conservation Education Programme.	WCST/MCT Wildlife Clubs
PFM- Protection & Restoration of Forests in the catchment supported by Danida, Finnida and World Bank.	DFB-MNRT.
Effect of Agriculture on Lake Manyara	TAWIRI, TANAPA, thru WD (TWPF).
Nomination of Rift Valley Lakes for World Heritage sites	BirdLife and partners
Lake Natron Consultative Group, lobby against soda plant.	BirdLife, WCST and 50 partners.
LF Tracking Program (pending)	Max Planck, SSG/IUCN.
Marabou Stork Tracking Program (vv LF)	TBAP, WCS,
BirdLife/WCST Lake Natron Project (Jensen), Support to local communities.	BirdLife, RSPB, WCST, WD, DC, IPI.
Soda Lakes Research, study of water cycles including LF and lake Natron.	Leicester University, SUA, USDM, Nairobi University, TAWIRI, WD, etc
Support to WMA Lake Natron.	AWF and Longido DC.
Study on mortality LF in Momella, Manyara, etc	UDSM.
Training in wetlands management, Lake Natron	Mweka College.
Studies Lake Manyara to develop WMA and protection	AWF & Manyara NP.
Support WMA around Burunge.	Babati DC.
Strengthening site support groups (Tanzania/Regional)	RSPB/ BirdLife/WCST/IPI.
Think Pink Campaign (Natron)	RSPB/ BirdLife/WCST.
b. Planned/Pipeline Projects	
Eco-hydrology study of LF in Lake Natron (Disney)	Leicester University/RSPB
Strengthening knowledge for decision making (Natron)	Leicester/RSPB/BirdLife/WCST/SUA, etc.
Support to WMA Lake Natron.	Mawalla Trust

. Development Projects

Project	Responsible/Contacts
Proposed Soda Ash Extraction plant at Lake Natron, Tanzania by TATA inc. and National Dev. Corporation state agency (pending EIA).	TATA Chemicals and Tanzania Government
Community Catchment Irrigation	OXFAM, around Lake Natron
Serengeti Road, via Ngaresero	TANROADS
Development projects of local authorities	Local Government
Water supply projects	Ministry of Water and irrigation
Changes in Land use	Ministry of Lands and Settlement
Geothermal power –	Proposal
Support to piped water/boreholes	IPI and Japan/SIDA.

Table 12:

Opportunities And Risks For The Conservation Of Lesser Flamingo In Tanzania.

Opportunities	*Risks*
• Existence of relevant national and international laws (eg Natron as a Ramsar site). • Favourable conservation policies. • SOER wetlands is mandatory. • Inclusion of IMP/GMP in the district/PA development plans for various lakes catchments. • Increased awareness on the value of conservation by communities. • Existence of research capacity, e.g. in universities. • International support – technical & financial. • Protected areas already designated. • Many agencies undertaking research in flamingo habitats. • Public goodwill and response to Soda Mine EIA. • Adoption of participatory natural resource management strategies e.g. WMAs that enhance community participation. • LF SSAP developed. • NWWG AEWA SC has adopted the LF SSAP as key activity.	• Lack of harmony, leading to lack of coordination of policies, laws and mandates by different government agencies/institutions & NGOs creating conflict, confusion and overlap (eg Political conflict between mining & conservation, irrigation competes for water, need for energy leads to catchment damage, etc). • Negative and poor perceptions by the community in the Flamingo habitats in regard to environmental conservation issues (eg. Overgrazing, irrigation abstraction, etc). • Lack of institutions responsible solely for Lesser Flamingo conservation (eg Not in DDP, no regional forum, etc). • Apparent un-coordinated efforts & lack of synergies amongst stakeholders. • Limited local community participation in Lesser Flamingo conservation (economic value unclear). • Trans-boundary issues beyond control of Tanzania (ie Kenya HEP and irrigation and pollutants). • Trans-boundary issues within the control of Tanzania but currently not a priority (ie massive influx of Kenyan pastoralists into Natron area). • Inadequate resources (ie. Flamingo economic value is undervalued and has poor donor support). • Land use conflicts (encroachment, catchment agriculture, etc) • Trans-boundary movements and migratory nature of the Lesser Flamingos puts them at threat, needs regional cooperation. • Demand for agricultural land as a result of expanding human population, is causing catchment water cycle damage. • Sectoral priorities not in favour of Lesser Flamingo conservation (value unknown)(not poverty reduction related). • Eviction of pastoralists or establishment of new PAs in wetlands may work against raising awareness to protect the catchment. • At risk from natural disasters (e.g. volcanic eruptions from Oldonyo Lengai or climate change, like the 2009 drought). • Growing catchment population (Kenya and Tanzania) and poverty demanding more resources and more land and water.

Table 13:

Logical Framework Analysis of Kenya Lesser Flamingo SSAP.

(Source: Kenya Lesser Flamingo SSAP, 2008)

	Vision, Aim & Objective	Description and Justification	Indicators of success
Vision	A stable, viable and healthy East African population of the LF.	Lesser Flamingo are subjected to periodic mass die-offs, which if not arrested can result in a progressive decline in population density	Stable counts, birds in good health and reduced episodes of massive die-offs
Aim	To stabilize population size and distribution of the LF o at an average number of no less than 900 000 individuals within the next five to ten years.	The species population size has witnessed a progressive decline in population size as a result of a number of factors the most critical of which is the degradation and of its specialized habitat, hence the need to stabilize the population size.	Repeated annual and bi-annual coordinated Lesser Flamingo counts show population size stabilizing at an average of 900 000 individuals.

Objectives

	Vision, Aim & Objective	Description and Justification	Indicators of success
1. 0	All key sites maintained in good ecological condition (****)	Lesser Flamingos have specific habitat requirements (see Section 2) hence all sites need to be carefully maintained to meet these requirements.	Favourable ecological conditions for Lesser Flamingo survival are met and maintained at all key sites.
2. 0	Disturbance stopped at key non-breeding sites and at sites where birds are known have attempted to breed or to have traditionally bred (*)	In Kenya there are many non-breeding sites used for feeding and roosting. At these sites, human disturbance may can affect feeding and limit access to freshwater needed for drinking and washing. In areas where breeding occurs or attempts have been reported, breeding failure could have resulted from human disturbance.	Existence and enforcement of regulations on acceptable distance that people are allowed to approach feeding populations and known watering or potential breeding areas.
3. 0	Impact of poisoning and diseases on LF populations reduced (****)	Large-scale die-offs on feeding lakes in Kenya and Tanzania have in the past occurred and attributed variously to ingestion of industrial heavy metals, pesticides and cyanobacterial toxins. In some cases several infectious diseases have been singled out as having contributed to the deaths.	Bi-annual Waterbird counts and observational reports show a significant reduction in the frequency and intensity of mass die-offs in Kenyan Rift Valley lakes.
4. 0	An operational national and regional network and collaboration program for the conservation of the LF initiated and sustained (***)	Currently there are number of institutions and individuals studying different aspects of the Lesser Flamingo ecology and conservation. However, their activities are uncoordinated with limited exchange of study findings.	An operational national and regional networking group with an easily retrievable database of past, ongoing and planned studies on Lesser Flamingos and their habitats in East African region. A regular flamingo update report mailed to stakeholders.
5. 0	Knowledge gaps on aspects of the Ecology of LF such as population numbers and distribution, threats, values and causes of die-offs filled (***)	A lot of information on the species is still lacking, yet it is needed to better conserve the species	Research and monitoring reports and scientific publications on distribution, threats, values, causes of die-offs by 2009

Priority: * = Low, ** = medium, * = high, **** = critical**

Table 14:

Lake Natron Stakeholders Draft Integrated Management Plan (Feb 2008)

(Source: Produced during the Ramsar Advisory Mission, 2008)

Sl No	Actions Affecting Resources and Values	Environmental and Social Impact	Impact -	Impact 0	Impact +	Recommended Feasible Protection and Mitigation Measures	Action Plan
1	Delay in establishing IMP	a. Unsustainable investments in catchment affect the lake and its fragile environment.	3			a. RAM to launch process & give guidelines for IMP.	ST
						b. Undertake stakeholder & resource analysis (SOER).	ST
						c. Integrate IMP into District Development Plans (EAP).	ST
						d. Establish district basket fund for Wetland Friendly Investments (micro-projects).	LT
						e. IMP to include IWRMS/catchment management.	LT
						f. Assist Kenya to consider Ramsar registration and IMP.	LT
						g. Establish an IDC and Trans-boundary management institution as a Ramsar EAC Regional Initiative.	LT
2	Proposed Soda Ash Plant impact	a. Flamingos affected by WQ changes, disturbance factors & physical obstructions.	3			a. Implement mitigation measures from EIA through EMP, and introduce SSAP into DDP.	LT
		b. Pressure on limited freshwater supply.	3			b. Undertake hydrological survey and develop water plan.	LT
		c. Local community derive limited SE benefits.	2			c. Conduct Cost Benefit Analysis of Business Plan.	LT
		d. Labour in-migration will cause SE problems.	2			d. Implement Social Development & HIV/AIDS Program.	LT
		e. Transport services disrupt game corridors.	1			e. Undertake separate EIA and EMP for roads, etc	ST
3	Proposed Mwatambo/ Ngarosero road impact	a. Environment consequences to fragile area.	1			a. Undertake EIA and EMP for road	ST
4	Economic importance to livelihoods undervalued	a. Livelihood practices put pressures on fragile environment.	1			a. Undertake economic analysis & develop Economic Development Plan for area	ST
						b. Provide supportive extension service	LT
						c. Convert GCA to WMA for community benefit sharing	LT
5	Tourism potential unrealized	a. Uncoordinated development puts pressure on fragile environment.	2			a. Develop local tourism plan including trans-boundary opportunities.	ST
		b. Irresponsible tourism threatens biodiversity.	2			b. Establish local tourism regulations on off-road and aircraft use.	LT
		c. Local communities not fully benefiting.	1			a. Expand packages to include cultural opportunities.	LT

6	Absence of a local management institution	a. Uncoordinated developments	2			a. Establish an IDC management institution.	LT
						b. Re-tool and re-train District/Village EMCs	LT
						c. Establish Ramsar Site Office & M&E implementation.	LT
		b. Lack of cross-border coordination.	2			a. Establish a Trans-boundary management institution.	LT
7	Unsustainable resource use	a. Unsustainable agriculture causing erosion.	2			a. Through LUPs & micro-projects instill sustainable land use.	LT
		b. Unsustainable pastoralism causing overgrazing.	2				LT
		c. Burning for grazing areas damaging catchment.	2				LT
		d. Irrigation overuse of water resources.	2				LT
8	Limited knowledge of ecosystem	a. Data insufficient to sustainably manage area.	2			a. Conduct research on flamingo biology.	LT
						b. Study the Gelai FR habitat and water balance.	LT
						c. Study game corridors (eg elephants).	LT
						d. Establish field centre for visiting scientists.	LT
9	Climate change sensitive area	a. Climate change affects livelihoods				a. Establish CC coping Strategy & implement actions.	LT
10	Security risk area	a. Severe poaching for food (eg zebra).	2			a. Instill anti-poaching campaign.	LT
		b. Cattle rustling threaten local herds.	2			b. Beef up police in area.	ST
		c. Security threat to tourists.	1			c. Beef up police in area.	ST

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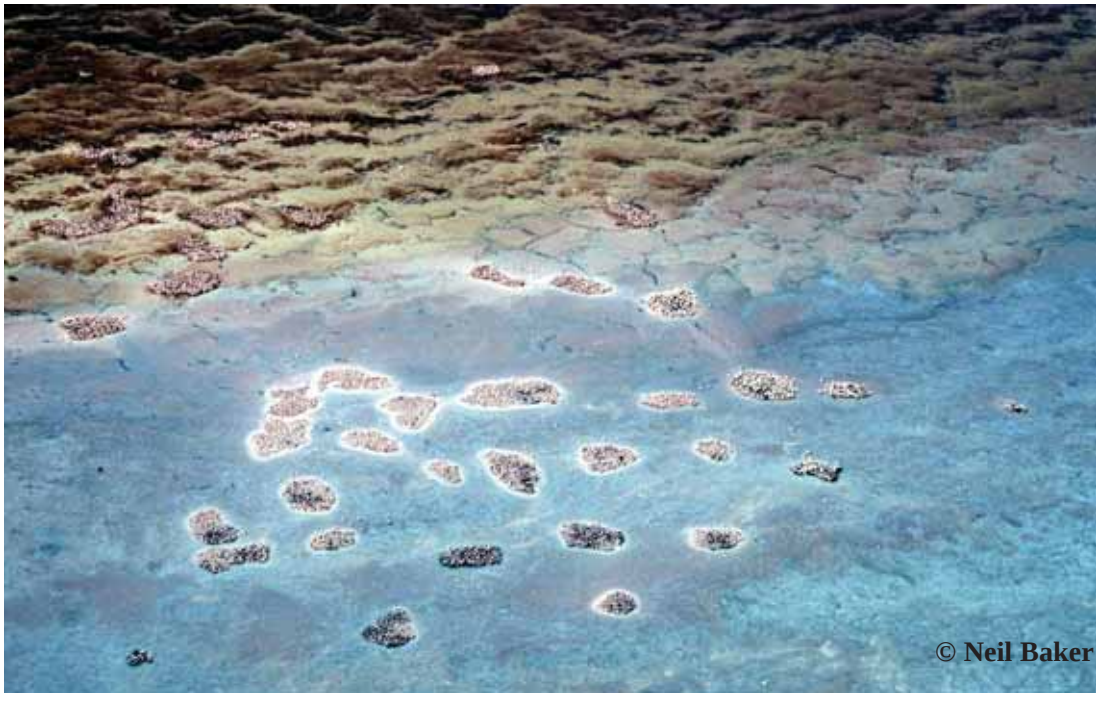
Table 15:Logical for Framework for Medium Term Tanzania SSAP For Lesser Flamingo: 2010-2015

Framework Objectives	National Activities to Achieve International Outputs	OVI	Tanzania Priority Sites													E Afr			Activities	By Whom	By When					Units	Unit Cost (USD 000)	Budget		Comments	Priority	
			Balangida Lelu Lakes	Bahi (Swamp)	Burungi Lake	Empakai/Magadi (NCA)	Eyasi Lake	Kitangiri Lake	Momella Lake(2/3NP)	Manyara (1/2NP)	Natron Lake (RS)	Ndutu Lake (Lagaraja)	Rukwa Lake	Singida Lake	Kenya	Ethiopia	Uganda			2010/11	2011/12	2012/13	2013/14	2014/15			Nos	Total Cost (USD 000)		National (1= high, 2 = Medium, 3 = low)	Natron IMP (1= high, 2 = Medium, 3 = low)
Obj 1: Ensure that all key breeding and feeding sites are maintained in good ecological condition	Designate key breeding and feeding sites as protected areas, Ramsar sites, BirdLife IBAs, WMA or, World Heritage Sites.	Existing Ramsar Site as WMA									*							LN RS developed into 1-2 WMA (including 9 +21 villages as CBO, LUPs, by laws, GMP, etc)	WD/WU & 2 districts & Birdlife.	*	*				Villages	10	30	300	Assisted by AWF and Jensen Foundation?	**1**	**1**
		New Ramsar Sites					1	1		1					1			To prepare the RIS and register with Ramsar. Assist Kenya.	WU-WD, KWS.	*	*				RIS	25	4	100	Birdlife assist Nature Kenya (NK) & KWS.	**2**	**1**
		Trans-boundary Ramsar Site													1			LN Catchment in Kenya to be assisted to establish as a Ramsar Site.	WD/WU & WCST (KWS, BLI, NK, etc)	*	*				RIS	25	1	25	Collaborate with KWS, BLI, NK and proposal to Ramsar.	**1**	
		IBA Status	*	1	*	*	*	*	*	*	*	*	*	*				To be written up in IBA register	TBAP, WCST & WU-WD	*					IBA Report	5	1	5	Bird count needs to be undertaken	**3**	
		CBNRM or WMA	1	1	*	1	1	1	1	1	*	1	1	1				Engage VNRC or WMA in formulating and implementing plans	DC, VNRC	*	*	*	*	*	Management Plans	5	11	55	A priority.	**3**	**1**
		World Heritage Site				*				1	1	*						Establish Natron as a WHS and upgrade Manyara.	WD/WU & WCST & VPO	*	*				WHS	25	2	50	Link with Albert Rift UNEP/NMK/Birdlife	**1**	**1**
	Identify baseline conditions of habitat suitability for Lesser Flamingos (thru SOER) and ensure that key sites are maintained in favourable ecological status.	SOER wetlands EMA mandate	1	1	1	1	1	1	1	1	*	1	1	1				Baseline SOER (inventory) by districts (Target 1 of AFM). Ngorongoro and Longido u/way.	DFT/PMO-RALG & NEMC	*	*	*	*		SOER	10	12	120	Lake Natron u/way.	**1**	**1**
		M&E of SSAP	1	1	1	1	1	1	1	1	1	1	1	1				AEWA SC to establish and implement IBA M&E system	AEWA SC	*	*	*	*	*	NWWG M&E Report/yr	10	5	50	As part of annual waterbird count	**2**	**1**
	Conduct SEA & EIA and audits of existing and future operations at all key sites, and mitigate as required.	EIA/SEA			1		1		1	1	*		1	1				EIA/SEA audit of current/future development & livelihood pressure. L. Natron need special attention.	TANAPA, DC, NEMC & WD/WU.	*	*	*			EIA/SEA Audit Reports	5	6	30	L Natron Audit, still u/way for soda plant.	**1**	**1**
	Identify management needs of Lesser Flamingo habitat (thru EAP) at key sites & implement necessary management actions (VDP/DDP/GMP)	Site EAP (EMA Mandatory)	1	1	1	1	1	1	1	1	*	1	1	1				Ngorongoro and Longido u/way. All DC to include Lake in DDP (and EAP) (Target 1 of AFM)	DFT/NEMC	*	*	*			EAP/Yr	5	12	60	Natron is assisted by Danida thru SWMP.	**2**	**1**
	Develop and implement integrated (catchments & coastal) management plans (IMP) for the key sites (as part of VDP, DDP, PA GMP)	IMP					1	1		1	*							IMP developed by districts/PA (Natron u/way thru WMA process and LF SSAP)	WD/WU and DFT	*	*	*			IMP	25	4	100	Lake Natron is under SWMP. Tz SSAP LF has been completed.	**2**	**1**
	Maintain (or restore) favourable catchment, hydrological conditions and water quality for LF (eg. micro-projects) & adapt to climate change.	WFI or Micro-projects					?	?		?	*							9 village around LN establishing WFI (Target 3 of AFM). Others need CBNRM steps first.	VDC, DFT & WU/WD & TANAPA, AWF,	*	*	*	*	*	Villages	5	50	250	9 villages Natron under SWMP thru DDP.	**3**	**1**
	Raise awareness about the conservation needs of the species at national and local level.	CEPA Program Comm Strategy					1	1	1	1	*							CEPA to include Clubs, brochure on wise use, with audio-visuals, etc	MCT and WCST	*	*	*	*	*	Clubs	5	50	250	MCT 11 natron clubs & WCST 1 SSG	**1**	**1**
		Crimson Wing Film	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Swahili version of Crimson Wing shown to schools/community	NL/DN, MCT/WCST	*	*	*			Film Shows (nationwide)	1	50	50	Natural-Light Films to f/up.	**2**	**2**
Obj 2: Ensure that breeding colonies are not disturbed	Prevent human disturbance (especially low flying aircrafts) through legislation, planning, zoning and thru enforcement of these rules as appropriate	District By Laws									*							Natron 2 DC/9 RS villages u/way based on LUPs (Target 2 of AFM). Need to include others.	DC and VDC	*					Villages with District By Laws	5	30	150	To be enforced thru VGS. Add villages thru WMA.		**1**
		Zoning on low flying								?	1				1			Establish a no go zone over lake Natron (and others).	Director civil aviation, WD, KWS, NEMC.	*					Zoning Law	10	1	10	Kenya to be asisted to legislate on day trips by air.	**2**	**2**
Obj 3: Reduce the effects on regional populations of poisoning and/or diseases	Establish an integrated flamingo health surveillance programme to assess the cause & effect of mass die-offs on EA LF populations	Health & pollution M&E					1		1	1	*			1				Establishment of a LF Health M&E system	TANAPA & SUA/LU, TAWIRI, WCST	*	*	*	*	*	M&E Reports/ 1 yr/lake	6	5	30	Leicester University proposal for Natron.	**2**	
	Raise awareness amongst community & decision makers and industry & others about the risk of pollution to the Lesser Flamingo	CEPA Material on Pollutants distributed	1	1	1	1	1	1	1	1	1	1	1	1	1			CEPA materials on pollution developed and implemented	SUA, WCST, ARDHI,WWF, AWF, MCT, DC	*	*	*	*		CEPA materials & distribute	20	4	80	Link to CEPA in general	**1**	**1**
	Ensure that pollution guidelines/legislation at key sites reflect the sensitivity of the species	Pollution guidelines	1			1		1	1	1				1				Pollution guidelines disseminate to assist district by laws	WD, NEMC, WCST		*	*			Pollution Guidelines	10	1	10	Consult international LF experts	**2**	**2**

	Ensure that pollution guidelines/legislation are developed and enforced, especially with reference to agro & industrial chemicals and heavy metals.	District By Laws enforced	1		1		1		1	1				1				Turn Guidelines into District By laws	DC & NEMC				*	*	District By Laws	5	6	30	DFT meet to develop by laws.	**2**	**2**
Obj 4: Ensure that trade in live specimen & egg harvesting have no negative effect on regional Lesser Flamingo populations	Maintain quota on trade in Lesser Flamingo specimens, and retain ban on body parts and eggs.	Regulate Trade	1	1	1		1	1		1	1		1	1				WD to continue to regulate capture and trade at 1600. Need regular inspection & M&E of capture.	WD/WU CITES	*	*	*	*	*	WD Regulations & M&E/yr	5	5	25	Separate regulations to be issued on trade control & M&E.	**1**	**1**
	Regulate and enforce a stringent trade licensing mechanism at the national level, based on an assessment of the effect of trade on regional Lesser Flamingo populations, in combination with other factors.	Number Losses during trade	1	1	1		1	1		1	1		1	1				Build trapper/trader capacity based on studies on better feeding and handling.	WD, WCST, CAWM, SUA, USDM, DC & TAWIRI.	*	*	*	*	*	Study and Training	15	2	30	Traders/trappers to be trained to improve survival capture rates.	**2**	**2**
Obj 5:Ensure that collisions with man-made structures are minimised	Avoid crossing important Lesser Flamingo habitats and flyways when routing new power lines, telephone lines, fences, light masts and guide wires, wind turbines & EIA existing.	SEA & EIA Guidelines on LF	1	1	1	1	1	1	1	1	1	1	1	1				Undertake a SEA of collision risks. Develop supplement to EIA standards as affect LF.	VPO-DOE, NEMC	*	*				SEA & Guidelines	10	2	20	One SEA study to cover all lakes.	**3**	
	Map LF Flyways for use in zoning and distribute widely to public, decision makers, developers, etc.	Flyway Maps	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Track LF movement (See 7.2.) and map flyways, zone lakes and disseminate information	WD, SUA, TAWIRI, WCST	*	*	*	*	*	Flyway Map & Publications	15	5	75	Link to research on tracking.	**2**	**2**
	Place streamers to make existing obstacles in flyways more visible	Streamer on structures		1	1									1				Put steamers on existing lines.	Min Energy & TANESCO			*	*	*	Streamer per Lake	5	3	15	Start with mapping	**3**	
Obj 6: Minimise human disturbance at non-breeding sites	Prevent human catchamen damage & disturbance through legislation, planning, zoning and through enforcement of these rules.	District By Laws & Zoning			1		1	1		1								Engage DC and villages based on LUPs (Target 2 of AFM) in VDP/DDP, etc.	DC and VDC	*	*	*			Lakes with District By Laws on LF	7.5	4	30	To be enforced thru VGS.	**1**	
	Establish code of conduct and sensitise community, tour operators and tourists	Code Conduct Disseminated	1	1	1	1	1	1	1	1	1	1	1	1				Develop guidelines, posters and brochures to engage community.	WCST, CEPA	*	*	*			Code in place in Lake	5	12	60	Link to EIA guidelines in general	**1**	
Obj 7.1: Fill population numbers and distribution knowledge gaps	Determine population sizes and trends by developing a monitoring strategy and protocols (numbers, distribution, key sites), conducting regular coordinated aerial population surveys at non-breeding sites, at least tri-annually, monitoring breeding populations and breeding success annually at all primary breeding (nesting) sites, and identifying potentially unknown breeding (nesting) and non-breeding sites	Annual Census	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	EAC synchronised annual aerial surveys (aligned with AfWC) at non-breeding time. Encourage districts to do routine ground M&E.	TAWIRI, SUA, WCST, Mweka DC, TANAPA, NCA.	*	*	*	*	*	Annual Aerial Survey all lakes	40	5	200	Link to SSC-IUCN on-going study.	**1**	**1**
		Monthly Census									1							Detailed monthly census of breeding cycle at LN	TAWIRI & WD.	*	*	*	*	*	Monthly Aerial Count	5	60	300	PhD Study.		**1**
	Determine population delineation & movements by conducting satellite tracking & ringing studies to determine movements of individuals between lakes, interchange & possible gene flow between populations, site usage, and relations with food availability and quality.	Tracking M&E	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Satellite tagging of LF and mass fledging ringing (colour coded by lake/country) at LN of year class.	SSG & WCST, TAWIRI, SUA, TBAP.	*	*	*	*	*	Tagged Bird 3year record	10	30	300	PhD study	**2**	**2**
		Satellite History									1							Studying historic patterns of nests from available satellite data.	SSG & WCST, TAWIRI, SUA	*	*	*			Satellite Study	20	1	20	Part of the above study		**2**
	Establish a health surveillance strategy and conduct an integrated flamingo health surveillance programme to assess the effect of mass die-offs on Lesser Flamingo populations	Health M&E																See above Obj 3.	As above						Health M&E			0	Linked to Obj 3.	**1**	**1**
	Establish and maintain database on trade losses.	Trade Database																Collection capature data and losses	DC, TANAPA, CITES, WCST, NCA, WD	*	*	*	*	*	Database update/Year	5	5	25	Link to CITES or TRAFFIC records	**3**	
Obj 7.2: Fill demographic knowledge gaps	Systematically collect data on breeding success and recruitment, including factors influencing fluctuations in breeding populations, frequency of breeding by individuals, age of first breeding, reasons for breeding failure, the role of practice nest building, survival rates, population structure, plumage development, moult strategy (timing and location), relationship between nuptial display and start of breeding	Breeding M&E									1							Detailed breeding studies. (Potentially through remote camera imagery) to establish annual recruitment, and pressures (eg predation).	WCS, DN, SUA/LU & WCST.	*	*	*			Annual Breeding Study	25	3	75	PhD study.		**1**
Obj 7.3: Fill habitat requirement knowledge gaps	Systematically collect data on breeding habitat requirements, including the role of rainfall in determining breeding success.	Hydro-chemistry study									1							Collecting hydrochemistry data to support above study.	WCS, DN, SUA/LU & WCST.	*	*	*			Annual Water Cycle Study	25	3	75	PhD study.		**1**

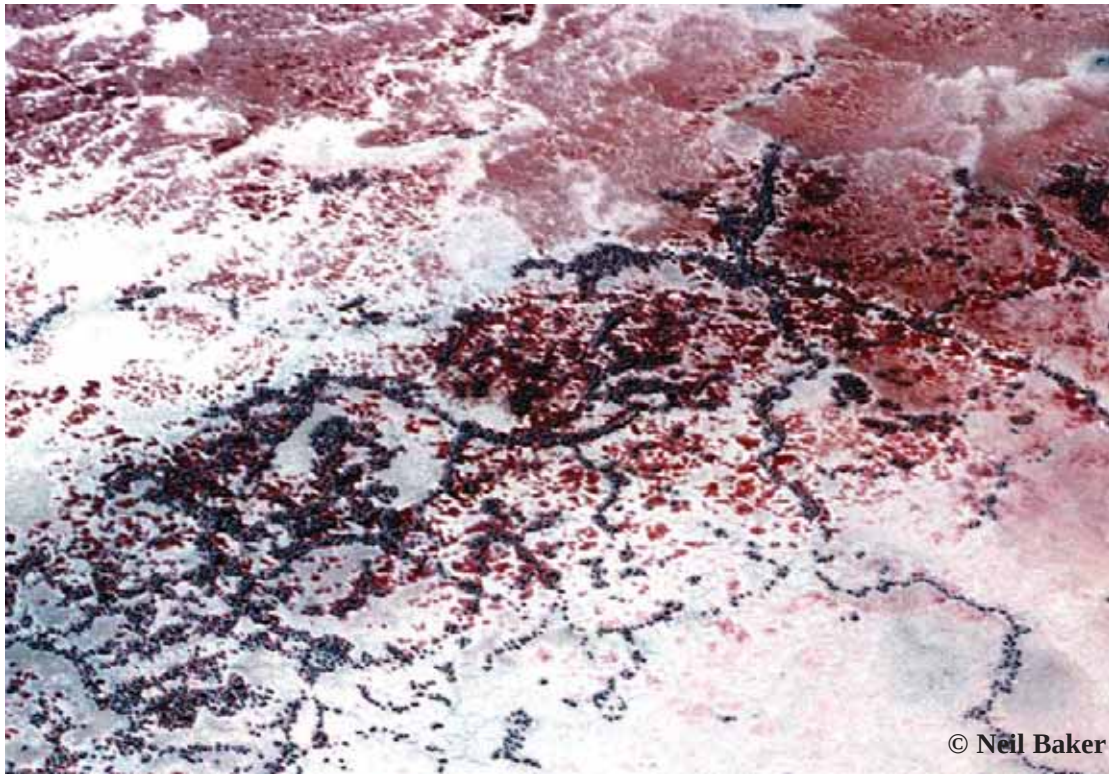
	Systematically collect data on feeding habitat requirements, including daily food requirements, food quality at key sites, carrying capacity of key sites, differences in freshwater & food requirements.	Fledgling Feeding Research									1						Study the food chain of LN and breeding cycle of LF. (NB. To show if migration is to freshwater or food?)	WCST, DN, SUA/LU.	*	*	*			Annual Fledgling Feeding	50	3	150	PhD Study.		1
		Adult Feeding	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Study of food chain and LF feeding.	WCST, DN, SUA/LU	*	*	*			Annual Adult Feeding	25	6	150	PhD Study on Natorn and one all lakes	2	1
	Understanding catchment processes, ecosystem services, hydro-chemistry, biodiversity and primary productivity linkages.	Catchment Research					1			1	1		1	1					Study of catchment livelihood economic pressures and environment	SUA, LU, TAWIRI,	*	*	*			Study Catchment	10	6	60	Annual study 3 lakes for 3 years.	1	1
		Transboundary Catchment									1				1				Interrelationships of Kenya and LN catchments	SUA, LU, TAWIRI,	*	*				Study Catchment	10	6	60	Annual study 3 years 2 countries		1
		Hydro-logical Study									1				1				Effects of hydrology of LN on breeding	LU, SUA, TAWIRI	*	*	*			Hydrology Study	50	1	50	Phd Study.		1
Obj 7.4: Fill disease and poison threats knowledge gaps	Systematically collect data on the role of diseases and poisons in population regulation, including the effects of infectious and non-infectious diseases	Toxicology Study							1	1	1								Toxicology studies on LF die outs (possibly thru egg analysis)	Illanois and SUA	*	*	*			Toxicology Study	50	1	50	Study lethal levels various toxins.	2	
	Model long-term effects of climate change and diseases	CC Research									1				1				Share with Birdlife Africa model study	Birdlife	*	*	*			Climate Change M&E	10	3	30	Study climate model.	2	1
	Evaluate the relative importance of different threats	SWOT									1				1				Part of LUP, IMP and SOER above	DC						SWOT of lakes	10	2	20	Field validation.	2	
Obj 7.5: Fill genetics knowledge gaps	Systematically collect data on the genetic relatedness within regional populations and genetic exchange between regional populations in order to detect genetic bottlenecks which might be dangerous for this species	Genetic Research									1				1	1	1		Genetic tagging (see satellite study) and DNA analysis	LU, SSC, TAWIRI, SUA	*	*	*			DNA study	25	3	75	PhD Study.	3	3
Obj 7.6: Fill Lesser Flamingo value knowledge gaps	Understand the cultural importance of Lesser Flamingos.	S/Economic Research									1								Link to economic study below.	LU, SUA, Birdlife									0	Not a priority at this time.	2	2
	Calculate the economic value of Lesser Flamingos to nations and local communities	Tourism Values	1	1	1	1	1	1	1	1	1	1	1	1					Economic assessment of Tourism Plan and of local values.	LU, SUA & TAWIRI	*					Tourism Value	5	12	60	Joint study. Birdlife economic study.	1	
		LN Economic Assessment									*								Study of livelihoods, LF and local economy and tourism.	Birdlife and SUA	*	*				Economic Report	14	1	14	U/way by Jensen fund.	1	1
Obj 7.7: Fill operational knowledge gaps	Assemble a Lesser Flamingo bibliography	Bibliography	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		Access the LF SSG web-site	AEWA SC	*	*	*	*	*	Bibliography published	5	1	5	Publication.	2	2
	Assemble a database of funding sources and make operational thru DeNRM Basket Fund	LF Trust fund Database																	Each implementing agency to lobby for own funding.	AEWA SC	*	*	*	*	*	NWWG Website			0	Link to DPG-E group proposed DeNRM.	1	1
Obj 8: General Institutional Framework and Administration of SSAP Implementation	Establish and run a National & Regional LF Network for joint SSAP implementation	AEWA SC & EA Forum	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		EA Network Regional Initiative. AEWA SC as national coordinator.	AEWA SC	*	*	*	*	*	Network/yr	20	5	100	Link to international LF Wgroup.	1	
	Establishment and operation of a Natron Ramsar PM Site Office and research laboratory and equipment	Site Office									*								Ramsar Site Office u/way at Ngaresero (Ngorongoro DC)	WD/RS PM	*	*	*	*	*	Office Operational/yr	50	1	50	Supported by SWMP.		1
		Research Centre									1								LF Lab/Field Center to be set up & equipped at Makat (Longido DC)	LU, SUA & TAWIRI	*	*	*	*	*	Laboratory Operational/yr	50	1	50	Disney Nature funds did not emerge.		1
		Office Staff									*								WD appoint Ramsar Site Manager	WD	*	*	*	*	*	RS PM/Yr	10	5	50	Appointed by WD .		1
		Research Staff									1								Laboratory Site Manager (PhD) and Administration Staff	LU, SUA & TAWIRI	*	*	*	*	*	Lab PM & staff/yr	50	5	250	Fund proposal under preparation.		1
		Office O&M									1								Office Operations, vehicle costs	WD, RS PM	*	*	*	*	*	O&M/Yr	20	5	100	Supported by SWMP.		1
		Lab Operations									1								Laboratory operations and maintenance costs	LU, SUA & TAWIRI	*	*	*	*	*	O&M/Yr	30	5	150	Fund proposal under preparation.		1
	Total:			19	19	20	15	26	21	21	28	34	15	19	22	17	8	8											**4479**			

Key: 1 = Action required * = Action underway



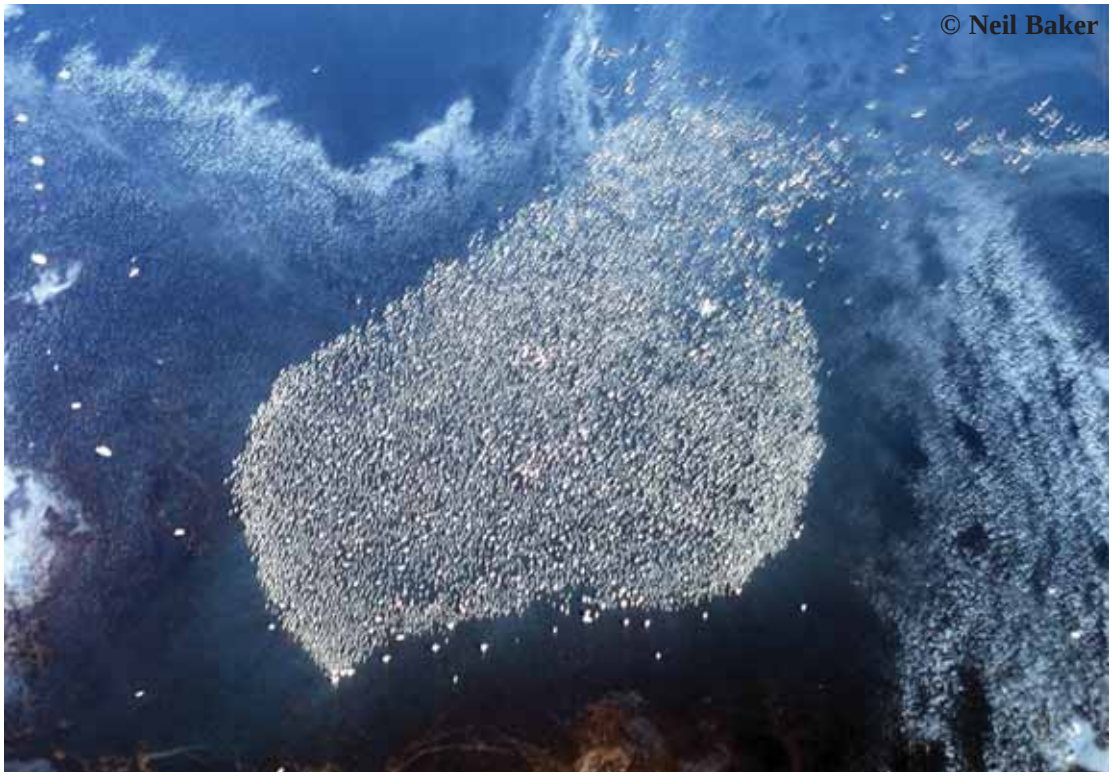
Flamingos require soft mud to build their nest mounds. In this image the colonies are situated along the east facing edge of the southern lagoon at approximately -2.5431S / 35.9982E. Those on the islands in the deeper water are at risk from flooding if the water level rises. Those on the trona (the crusty surface of Natron) are at risk from mammalian predators if the surface continues to dry. Cracks in the surface of the trona can just be seen around the drier colonies. Marabou Storks increasingly threaten these southern lagoon colonies, Fish Eagles are absent from this harsh environment.

Some individual chicks don't join crèches and are fed by adults, presumably parent birds. The red legs of this chick indicate that it is at least one week old.



On the flats in the northern third of the lake at approximately -2.2556S / 36.0551E, many of the colonies are built along surface cracks in the trona as this is the only source of wet mud. These colonies are secure from mammalian predators, only Marabou Storks are a potential threat here. However, these colonies can be several km from open water forcing the chicks into a hazardous trek, often through wet mud. This image shows well the old nest mounds as dark circles on the paler surface of the trona. In the future one can expect that images from Google Earth will allow an accurate estimate of the size of any breeding attempt.

Some birds brood younsters off moundsbut nothing is known of how successful this is. If rain turns the surface to caustic mud, such a young chick would be in danger.



An aerial image of a large crèche, the few adults in attendance can be discerned as larger white spots. Although out of focus this image does portray the scale of the larger crèches and the magnitude of the effort required to keep them moving to safer sites that provide food and less caustic water and mud. These treks can cover several km and for the northern breeders this can exceed 10km to relative safety. These crèches cannot be counted and used as evidence of successful breeding, only as an indication of successful hatching. Successful fledging is still some months away.

Adults and young chicks in a crèche at Lake Natron - the water here is wind blown wash from the southern lagoon onto dry flat. Direct rainfall could put these chicks at risk from caustic mud and the possibility of soda anklets forming

Lesser Flamingo and chick on the nest mound. Nest mounds can be twice this height. Mounds protect the eggss and chicks from flooding and ambient temperatures are lower than at they are at the surface.

Eggs stay white and do not rapidly stain brown. They can therefore be distinguished on high resolution aerial photos and used to estimate breeding effort.

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Tanzania Lesser Flamingo Single Species Action Plan (SSAP)