PESTALTO INTERNATIONAL
ENVIRONMENTAL HEALTH SERVICES

MALARIA MOSQUITO MANAGEMENT
VECTOR LARVACIDING

PRESENTATION TOPICS

1. Introduction – Pestalto International
2. Integrated Vector Management
3. Malaria and Its Impact
4. Vector
5. Reception & Progress in Ethiopia

PESTALTO ENVIRONMENTAL HEALTH SERVICES INC.

Incorporated 1999

Client List

Regional and Municipal

- The City of Hamilton Public Health Services
- Halton Region Health Department
- Regional Municipality of Peel, Health Services Department
- Regional Municipality of Niagara, Public Health Department
- Haldimand Norfolk Health Unit
- Middlesex London Health Unit
- Elgin St. Thomas Health Unit
- County of Oxford Board of Health
- Wellington Dufferin Guelph Health Unit
- Windsor Essex County Health Unit
- Leeds, Grenville & Lanark District Health Unit
- Regional Municipality of York, Health Services Department
- Park hill
- Pottageville, King Twp
- Labrador City, Labrador
- Churchill Falls, Labrador
- Labrador Straits, Labrador

Other Clients

- Ministry of Transportation Ontario
- Canadian Forces Base, Petawawa, Borden and 5 Wing Goose bay
- Oneida Nation of the Thames
- Chippewas of the Thames First Nations
- Ontario Power Generation Corporation
- Greater Toronto Airports Authority
- York Region Public and Catholic School Boards
- Peel Region Public and Catholic School Boards
- Niagara Region Public and Catholic School Boards
- Province of Ontario, Ministry of Health and Long-term Care
- University of Western Ontario
- Golf Courses, Private Adult Communities

Minimize the incidence of West Nile Virus in the human population at the community/regional level using Integrated West Nile Virus Vector Management

Integrated Vector Management

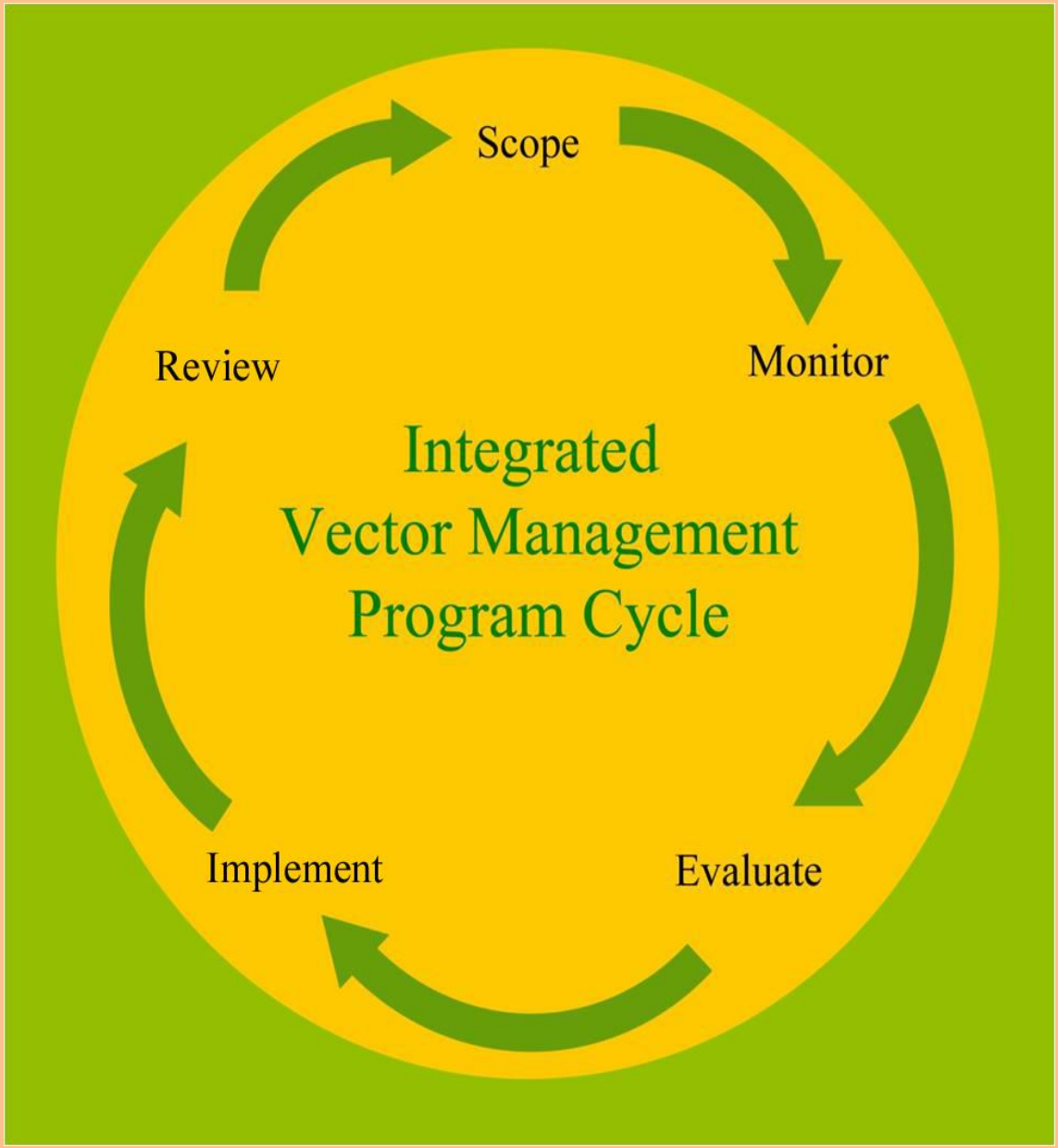
Decision Making Process

Set of Actions to Determine:

- if,
- where,
- when,
- how ,

vectors are managed.

Works on a macro program level and micro operational.

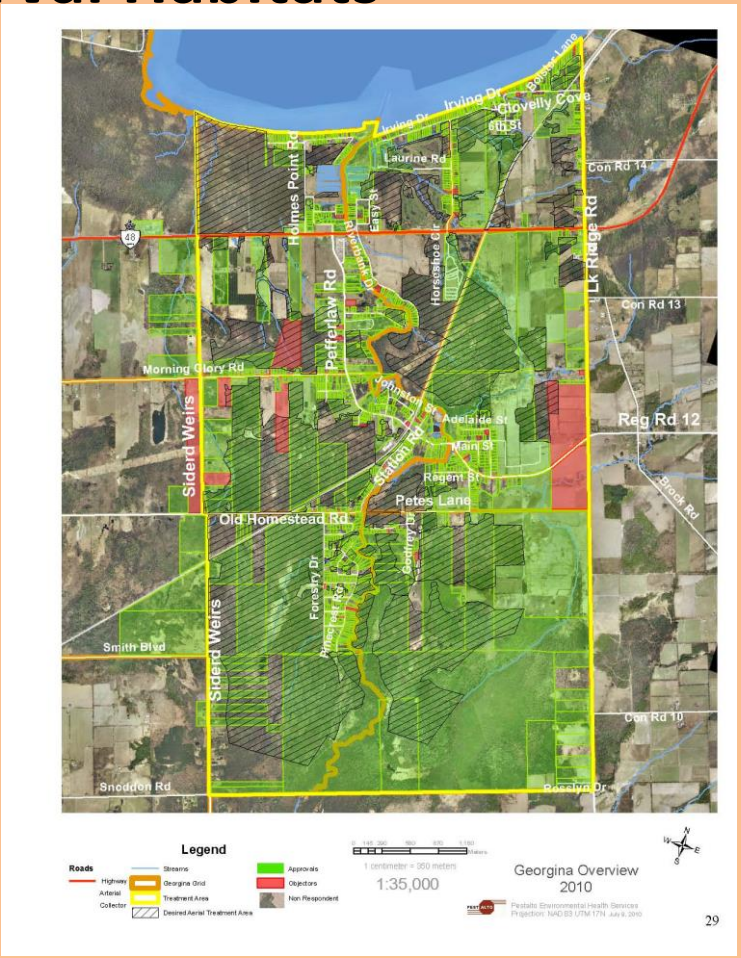


COMPONENTS INTEGRATED VECTOR MANAGEMENT

- Pest identification
- Understanding the pest/species life cycle(s)
- Understanding the cause and source of the pests
- Knowledge of mosquito larval habitats for various species
- Monitoring mosquito life stages
- Understanding the influence of the environment on the pest and control measures
- Consideration of all pest control techniques including habitat remediation
- Implementation and completion of mosquito treatment programs
- Recording key information from the operational program
- Evaluation of program

Annual Training of Part Time Workers

Training to Use GPS
to
Spatially Map Larval Habitats



Site Surveillance and Mosquito Larval Monitoring

Standing Water Surveillance & Treatment Form

Zone:	**Client ID:**	**Map ID:**
Municipality:		**City:**
Address/Description (FULL address including street type. No short forms):		**GPS Coordinates (Northing / Westing):** **N** (e.g. 44 ' 12 ' 01.043) ____ ' ____ ' ____ . ____ **W** (e.g. 79 ' 59 ' 13.238) ____ ' ____ ' ____ . ____
Environmentally Sensitive Area: YES NO		**Breeding Site Type:** Standing Water Sewage

Standing Water Description:	Artificial Container	Ditch	Field Pool	Pond	Storm Water Management Pond (SWMP)	Woodland Pool	Wetlands
Sewage Description:	Sewage Lagoon				Settling Pond		

Sequential Sampling (Dips 1-10 are **MANDATORY**, Only use Dips 11-20 if sample site area is over 2500m²)
If Pre Treatment Monitoring is done then Post Treatment Monitoring MUST be done on this sheet as well

Pool Rating:
If no larvae are collected, the site is rated as "nil"
If only 1-6 larvae are collected in 10 dips, this site is rated as "low"
If 7-30 larvae are collected in 10 dips, this site is rated as "moderate"
If >30 larvae are collected in 10 dips, this site is rated as "high"
If the number of larvae collected in at least 5 dips is 51 or more, the site is rated as "high"

Sample ID:										**Sample ID:**									
Driver Name:										**Driver Name:**									
Passenger Name:										**Passenger Name:**									
Date (mm/dd/yy): / / 07										**Date (mm/dd/yy):** / / 07									
Water Present: YES DRY FLOWING **Water Temp (°C):** ____										**Water Present:** YES DRY FLOWING **Water Temp (°C):** ____									
Emergent Vegetation: NIL LOW MODERATE HIGH										**Emergent Vegetation:** NIL LOW MODERATE HIGH									
Organic Level of Water: LOW MODERATE HIGH										**Organic Level of Water:** LOW MODERATE HIGH									
Pool Length (m): _____ **Pool Width (m):** _____										**Pool Length (m):** _____ **Pool Width (m):** _____									
Dip #		**1 & 2 Instar** 1-10 11-20		**3 & 4 Instar** 1-10 11-20		**Cumulative Number** 1-10 11-20		**Pupae** 1-10 11-20		**Dip #**		**1 & 2 Instar** 1-10 11-20		**3 & 4 Instar** 1-10 11-20		**Cumulative Number** 1-10 11-20		**Pupae** 1-10 11-20	
1	11									1	11								
2	12									2	12								
3	13									3	13								
4	14									4	14								
5	15									5	15								
6	16									6	16								
7	17									7	17								
8	18									8	18								
9	19									9	19								
10	20									10	20								
Pool Rating: NIL LOW MODERATE HIGH										**Pool Rating:** NIL LOW MODERATE HIGH									
Monitoring Stage: SURVEILLANCE PRE										**Monitoring Stage:** POST POST-PRE									
Sample Retained: **YES** **NO**										**Sample Retained:** **YES** **NO**									
Treatment: YES NO **Quantity Used (ml):**										**Treatment:** YES NO **Quantity Used (ml):**									
VectoBac 1200L **Application Rate (L/ha):**										VectoBac 1200L **Application Rate (L/ha):**									
VectoBac 200G **Application Rate (kg/ha)**										VectoBac 200G **Application Rate (kg/ha)**									
VectoLex CG										VectoLex CG									
Altosid Granules										Altosid Granules									
Date Data Entered (mm/dd/yy): / / 07 **Initials:**										**Date Data Entered (mm/dd/yy):** / / 07 **Initials:**									

Revision Date: April 2, 2007
Revision Level: 10

Pestalto Environmental Health Services Inc.
QP No. DC001

Larvaciding

Selected WHO recommended compounds for control of Mosquito Larva						
	Biologicals		Insect growth regulators			Remediation
	Bacillus thuringiensis israelensis	*Bacillus sphaericus*	Methoprene	Temephos	Novaluron	
Period of Control[1]	○	◑	◑	○	●	●
Ease of Application[2]	◑	◑	◑	◑	◑	○
Human Toxicity	●	●	●	◑	●	●
Bird Toxicity	●	●	●	◑	●	◑
Fish Toxicity	●	●	◑	◑	●	◑
Other Animal Toxicity	●	●	◑	◑	●	◑
Other Aquatic invertebrates	●	●	○	○	○	○
Breakdown in Water	●	●	●	●	●	-

○ Good ◑ Better ● Best

[1] Longer pefered
[2] Less dependance on equipment and ease of distribution prefered

BT H-14 LIFE CYCLE

The sequence of events associated with using Bacillus thuringiensis israelensis (Bti) for control of mosquito larvae.

1.
Larva feeds on Bti spores and crystals suspended in the water.

2. 5-10 Minutes
Spores and crystals enter gut of larva. Crystals dissolve.

3. 1-4 Hours
Cross section-larval mid-gut. Gut wall breaks down from action of toxic crystals.

4. 2-12 Hours
Crystals completely dissolve. Spores escape into body cavity. Larva dies.

Mosquito Larvaciding With Post-Treatment Monitoring

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Pestalto Environmental Health Services Inc.
QP No. DC001

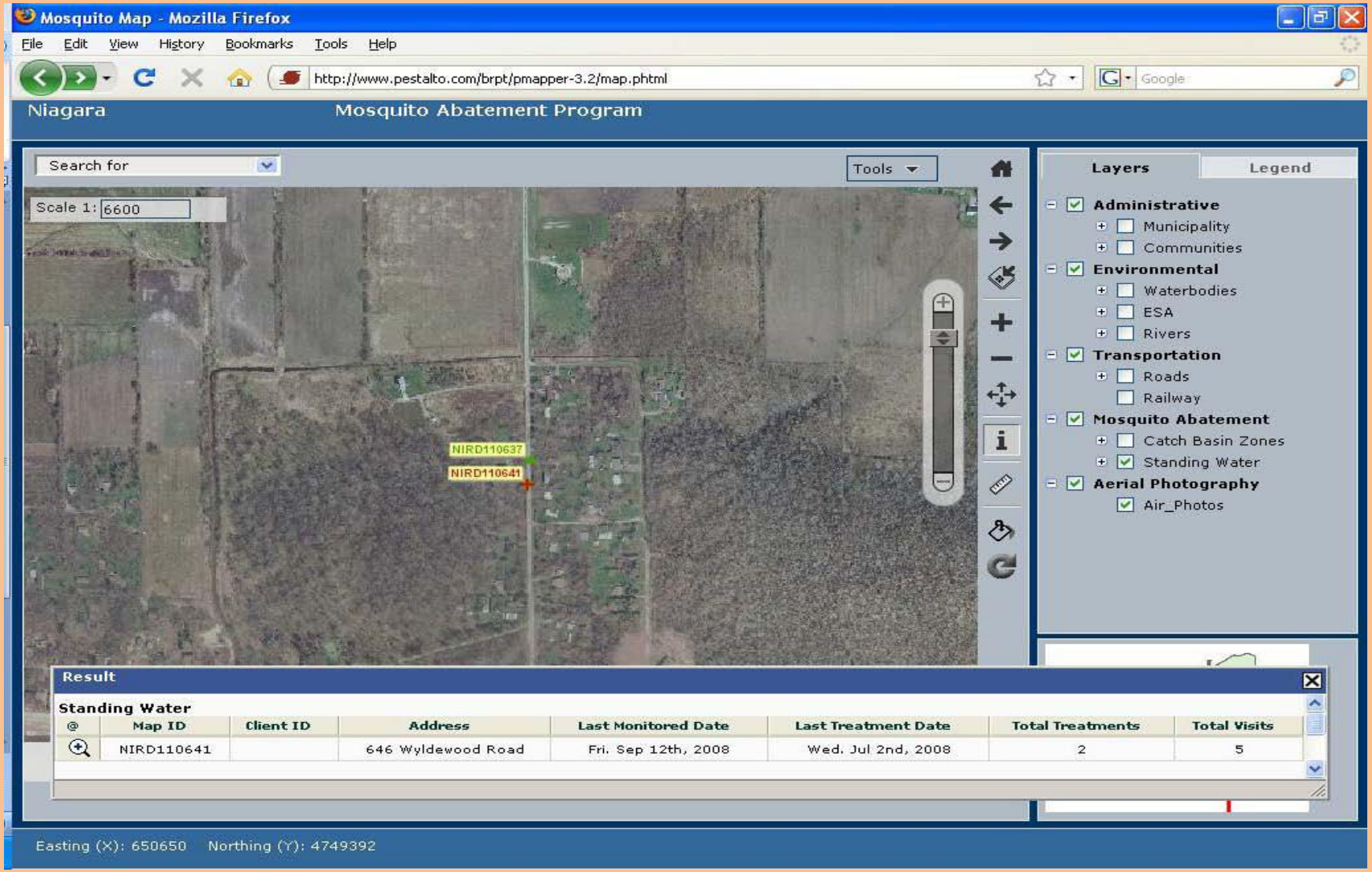
CDC Adult Mosquito Monitoring Trap

Mosquito Identification and Testing for West Nile Virus

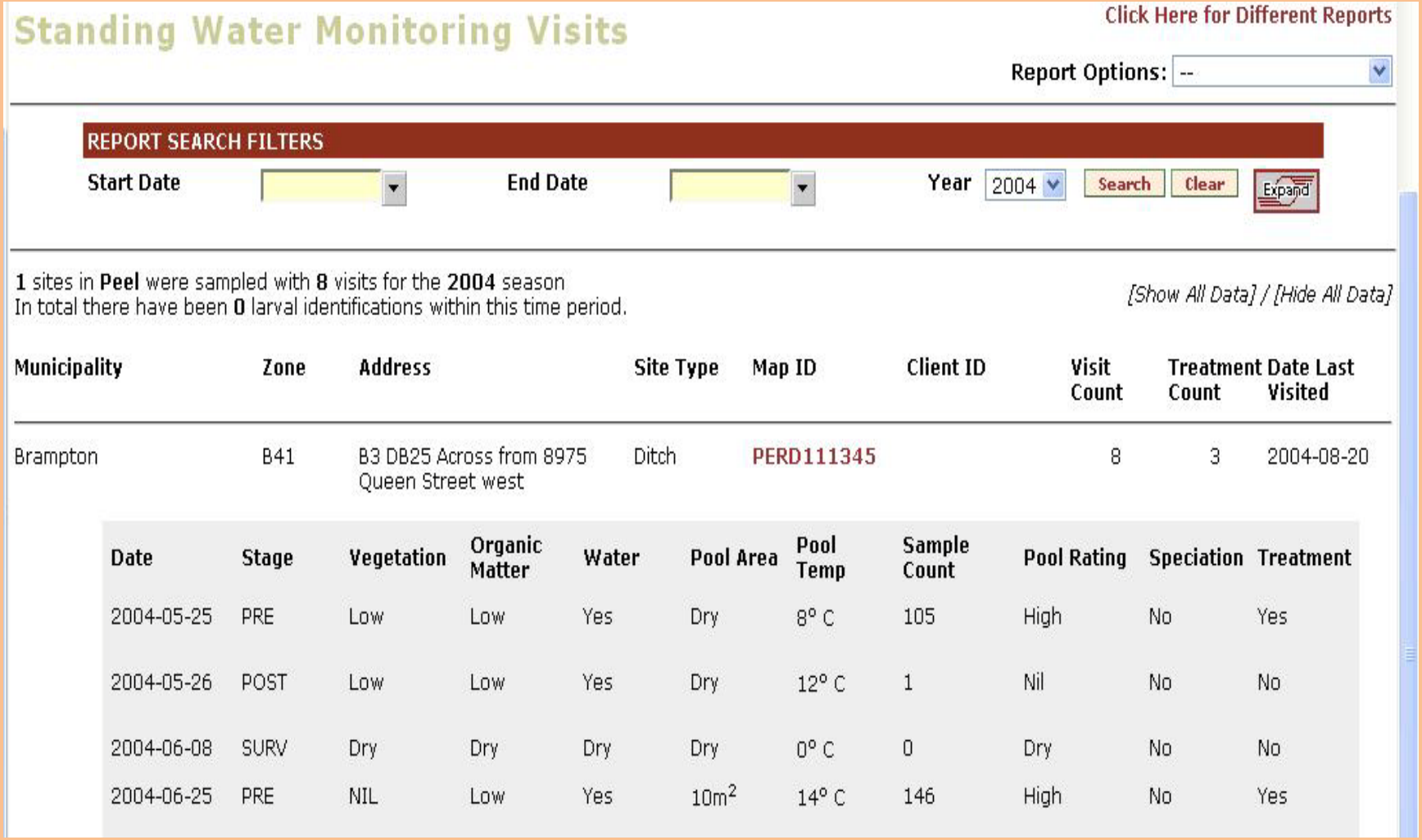
Larval & Adult Mosquito I.D.

Setting Up RT-PCR Reactions

Documentation



Documentation, Review, Recommendations



Standing Water Monitoring Visits

Click Here for Different Reports

Report Options: --

REPORT SEARCH FILTERS

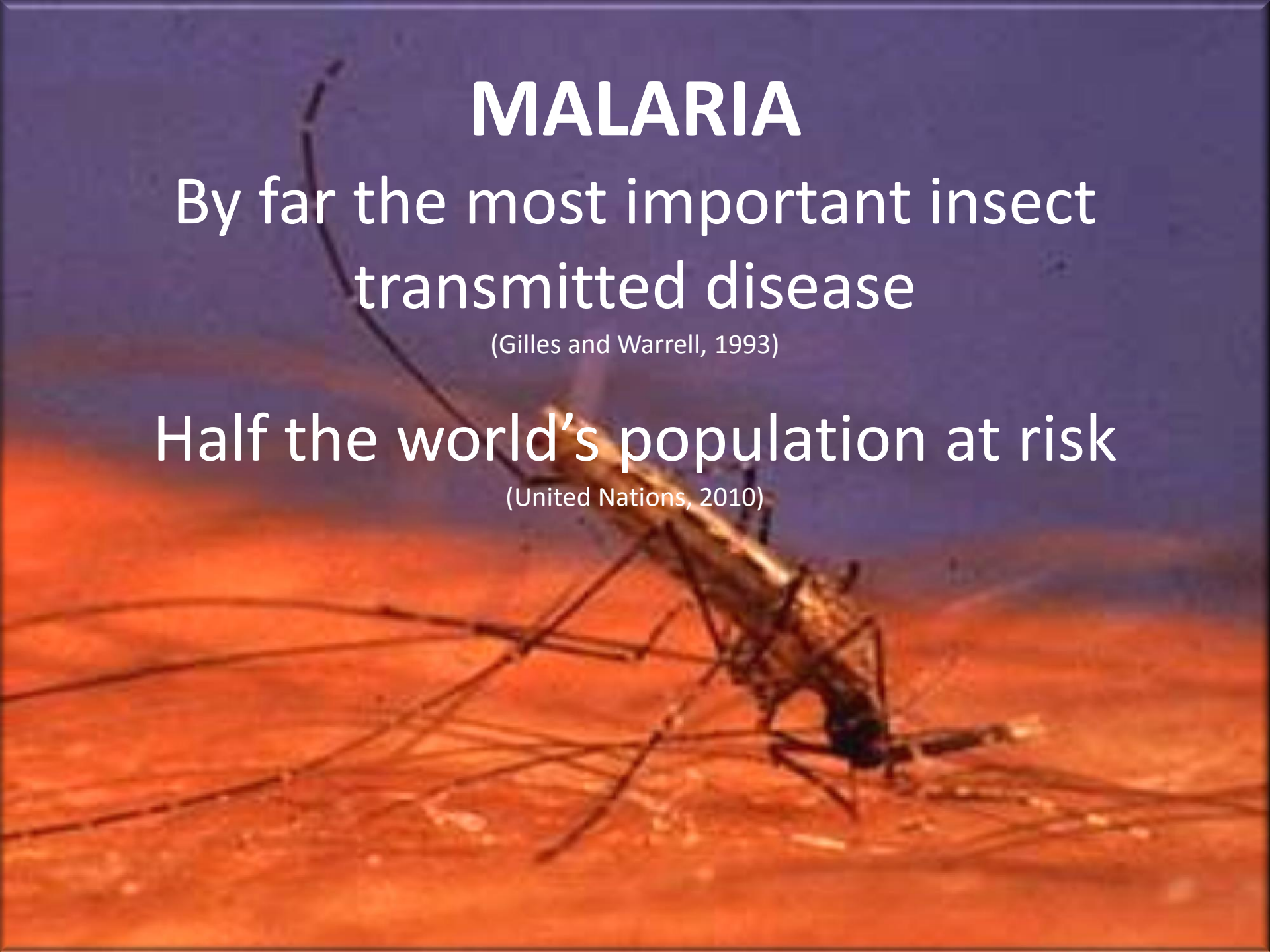
Start Date | End Date | Year 2004 | Search | Clear | Expand

1 sites in **Peel** were sampled with **8** visits for the **2004** season
In total there have been **0** larval identifications within this time period.

[Show All Data] / [Hide All Data]

Municipality	Zone	Address	Site Type	Map ID	Client ID	Visit Count	Treatment Count	Date Last Visited
Brampton	B41	B3 DB25 Across from 8975 Queen Street west	Ditch	PERD111345		8	3	2004-08-20

Date	Stage	Vegetation	Organic Matter	Water	Pool Area	Pool Temp	Sample Count	Pool Rating	Speciation	Treatment
2004-05-25	PRE	Low	Low	Yes	Dry	8° C	105	High	No	Yes
2004-05-26	POST	Low	Low	Yes	Dry	12° C	1	Nil	No	No
2004-06-08	SURV	Dry	Dry	Dry	Dry	0° C	0	Dry	No	No
2004-06-25	PRE	NIL	Low	Yes	10m^2	14° C	146	High	No	Yes



MALARIA

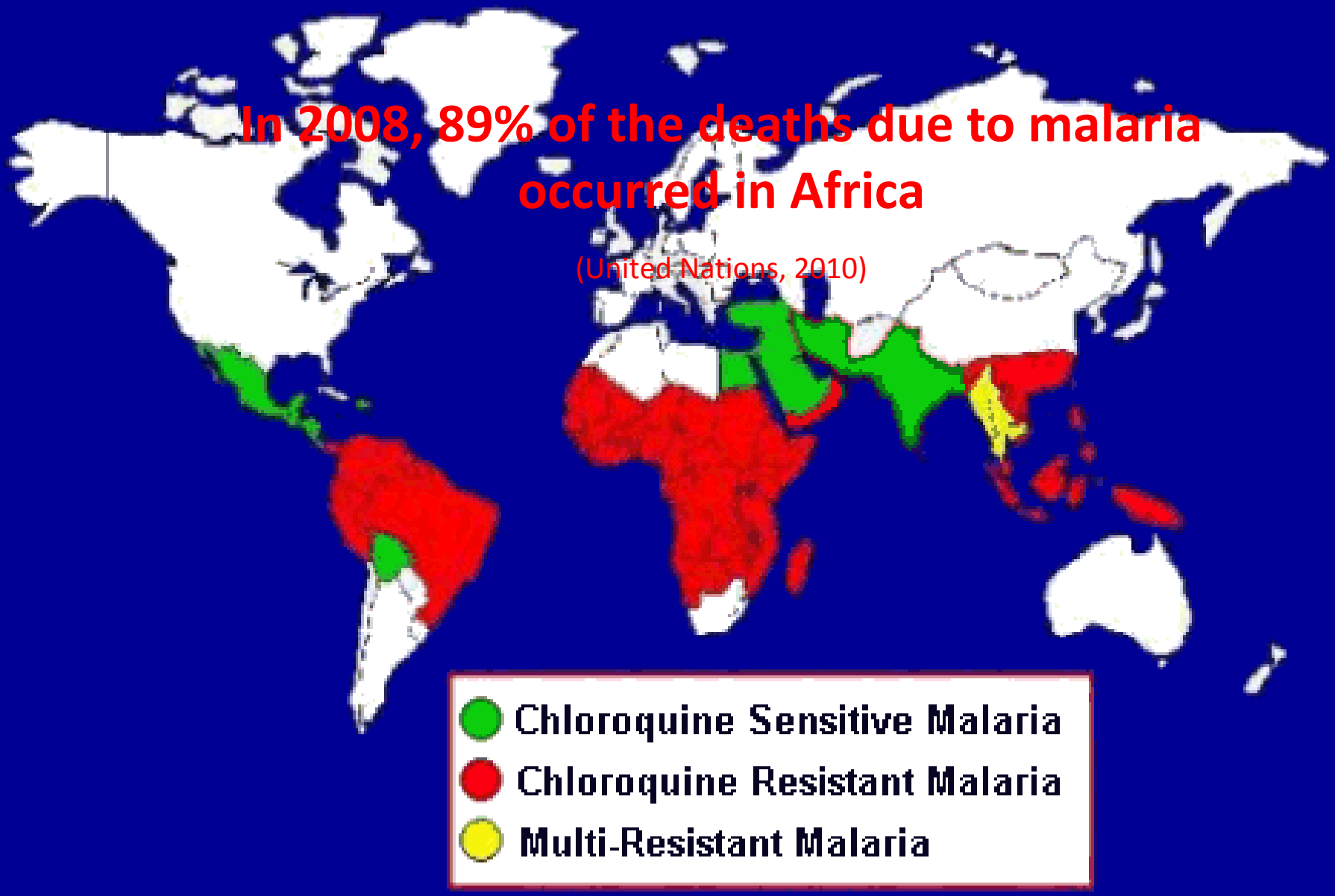
By far the most important insect transmitted disease

(Gilles and Warrell, 1993)

Half the world's population at risk

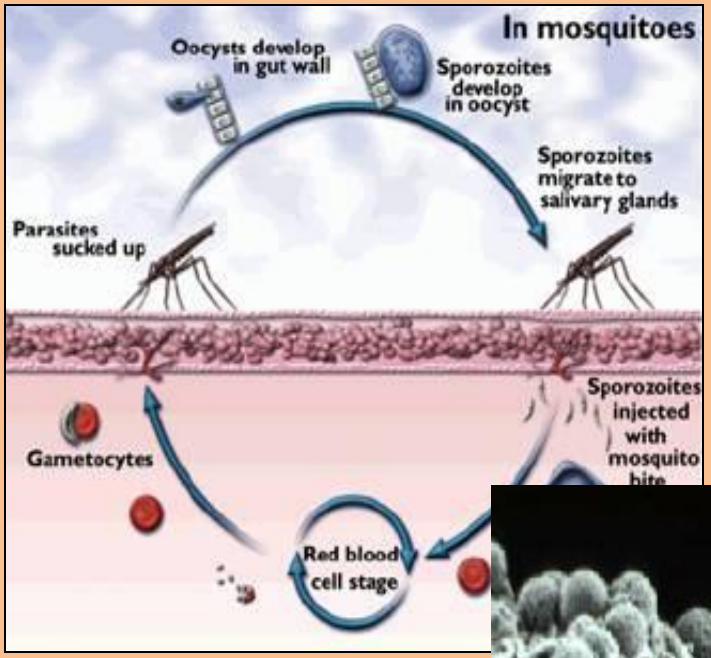
(United Nations, 2010)

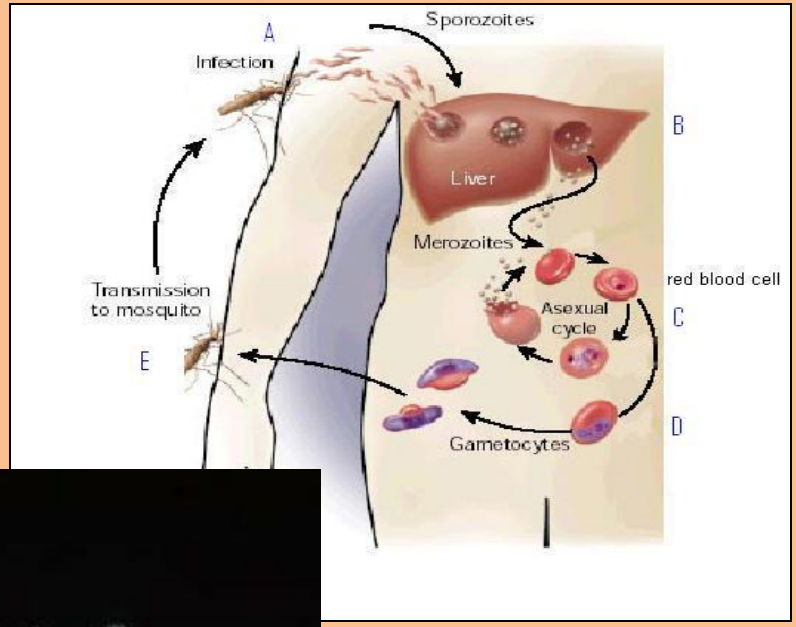
Malaria Endemic Areas

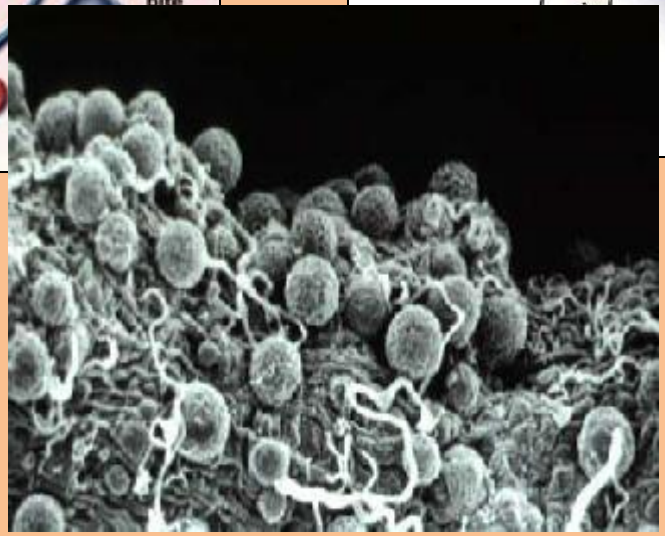



300-500 million cases of clinical malaria per year, with 1.4-2.6 million deaths, mainly among African children
(Curtis 2009)
Pestalto

Malaria *Plasmodium* Life Cycle







MALARIA SYMPTOMS

Symptoms include:

anaemia ,

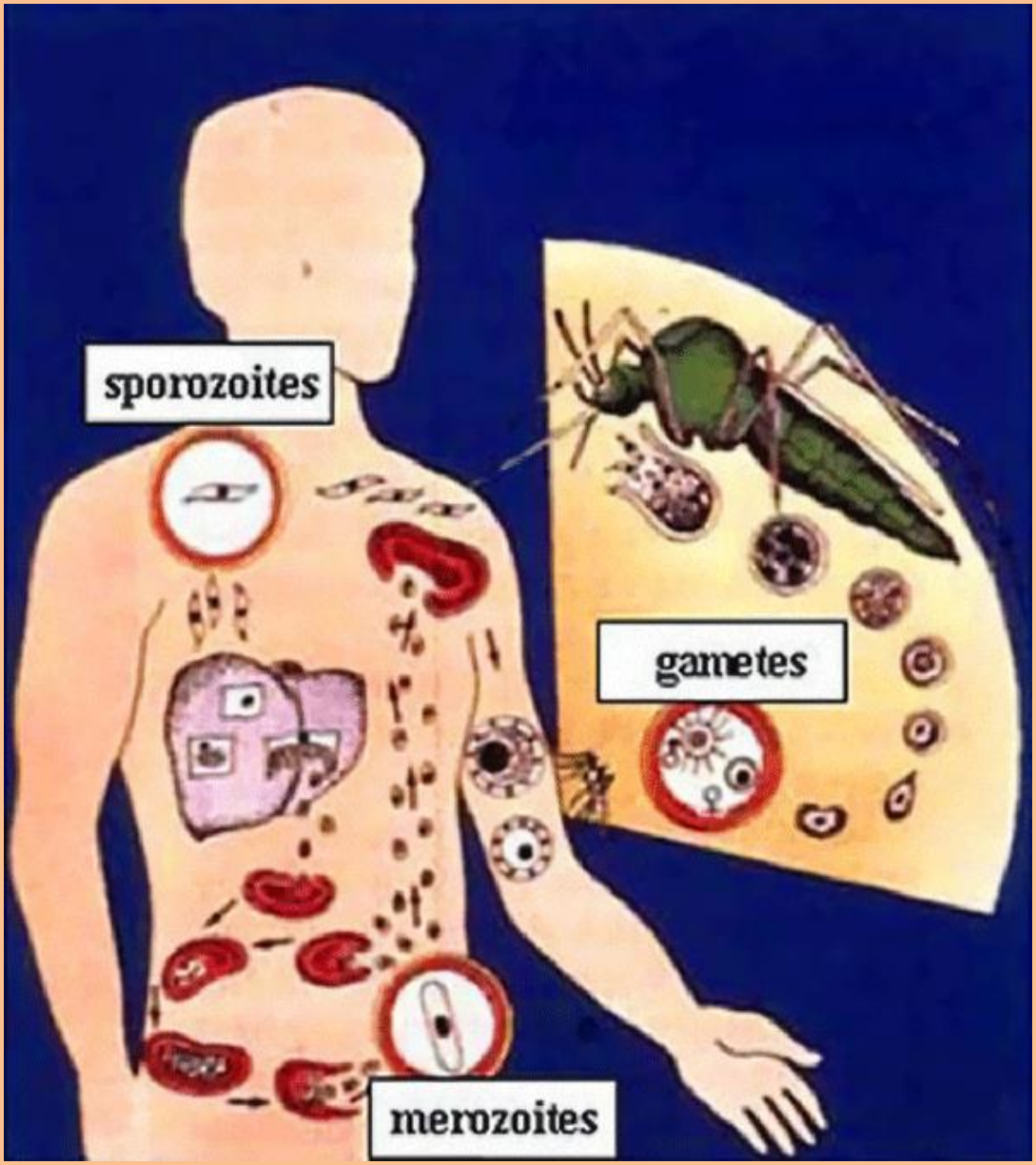
light headedness,

shortness of breath, fever and sweating, chills with shivering, joint pain, vomiting, convulsions, jaundice

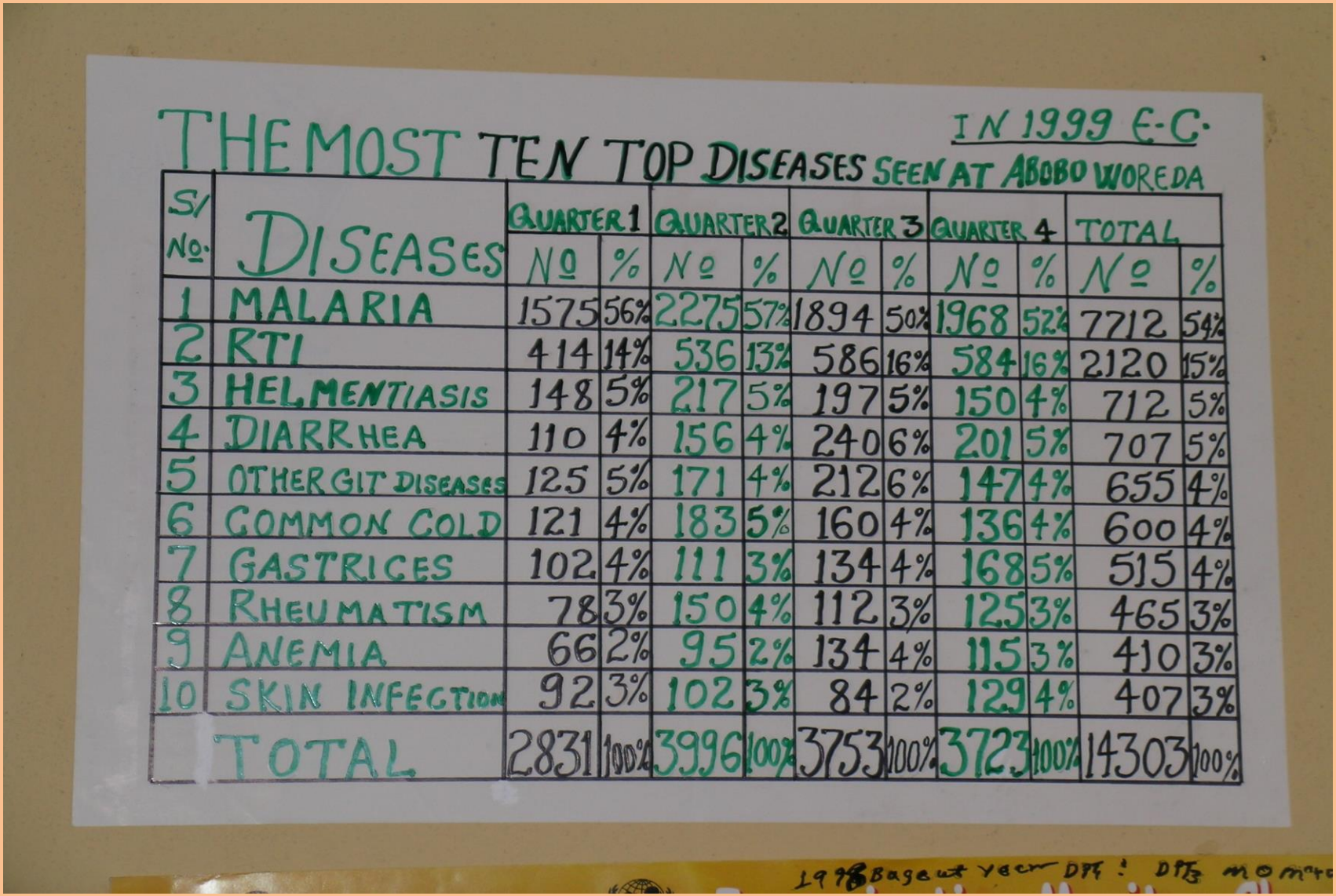
death

(WHO, 2010)

Symptoms usually appear between 10 and 15 days after the mosquito bite. If not treated, malaria can quickly become life-threatening by disrupting the blood supply to vital organs.



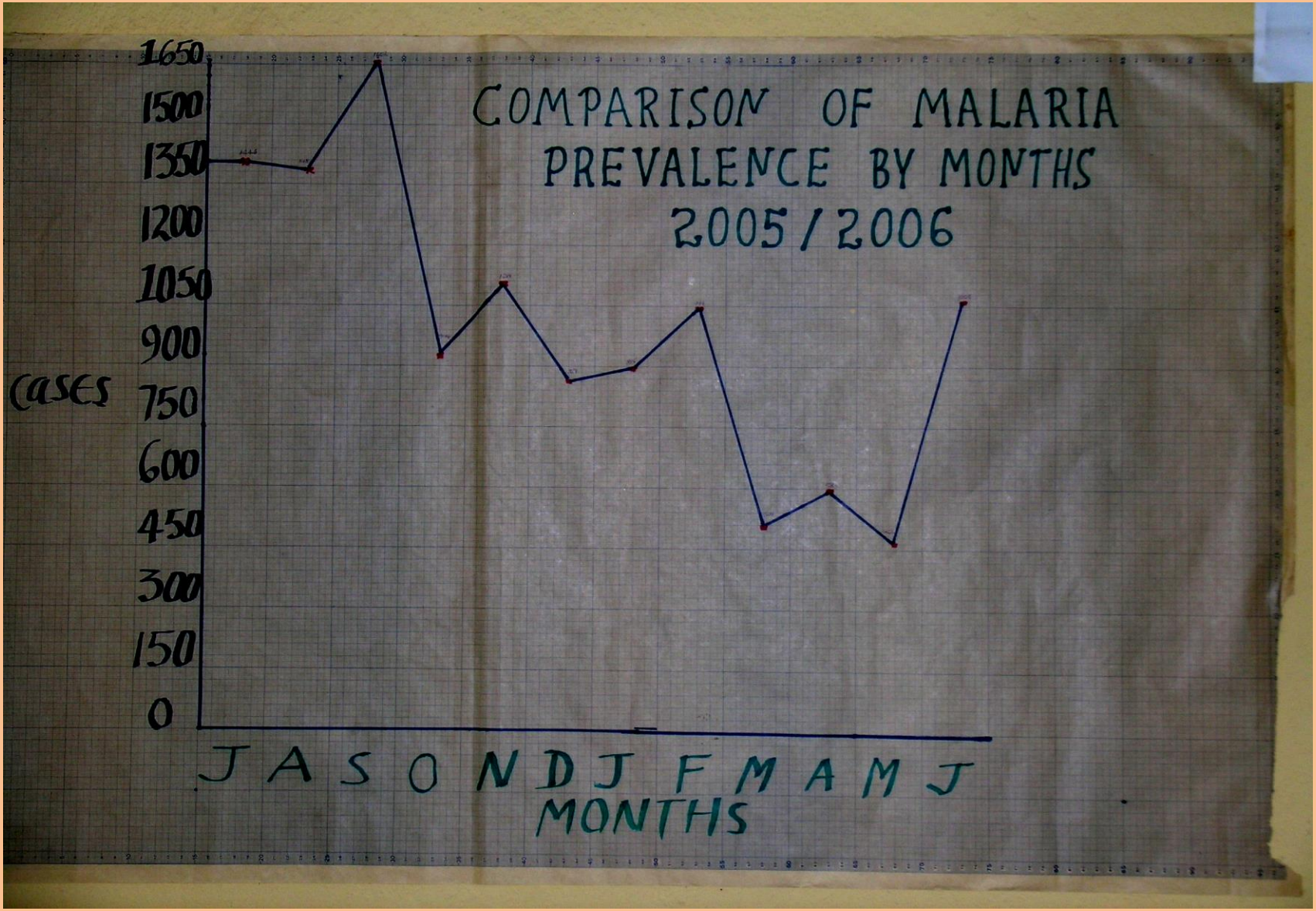
Hospital Records



IN 1999 E.C.

THE MOST TEN TOP DISEASES SEEN AT ABOBO WOREDA

S/No.	DISEASES	QUARTER 1		QUARTER 2		QUARTER 3		QUARTER 4		TOTAL	
		No	%	No	%	No	%	No	%	No	%
1	MALARIA	1575	56%	2275	57%	1894	50%	1968	52%	7712	54%
2	RTI	414	14%	536	13%	586	16%	584	16%	2120	15%
3	HELMENTIASIS	148	5%	217	5%	197	5%	150	4%	712	5%
4	DIARRHEA	110	4%	156	4%	240	6%	201	5%	707	5%
5	OTHER GIT DISEASES	125	5%	171	4%	212	6%	147	4%	655	4%
6	COMMON COLD	121	4%	183	5%	160	4%	136	4%	600	4%
7	GASTRICES	102	4%	111	3%	134	4%	168	5%	515	4%
8	RHEUMATISM	78	3%	150	4%	112	3%	125	3%	465	3%
9	ANEMIA	66	2%	95	2%	134	4%	115	3%	410	3%
10	SKIN INFECTION	92	3%	102	3%	84	2%	129	4%	407	3%
	TOTAL	2831	100%	3996	100%	3753	100%	3723	100%	14303	100%

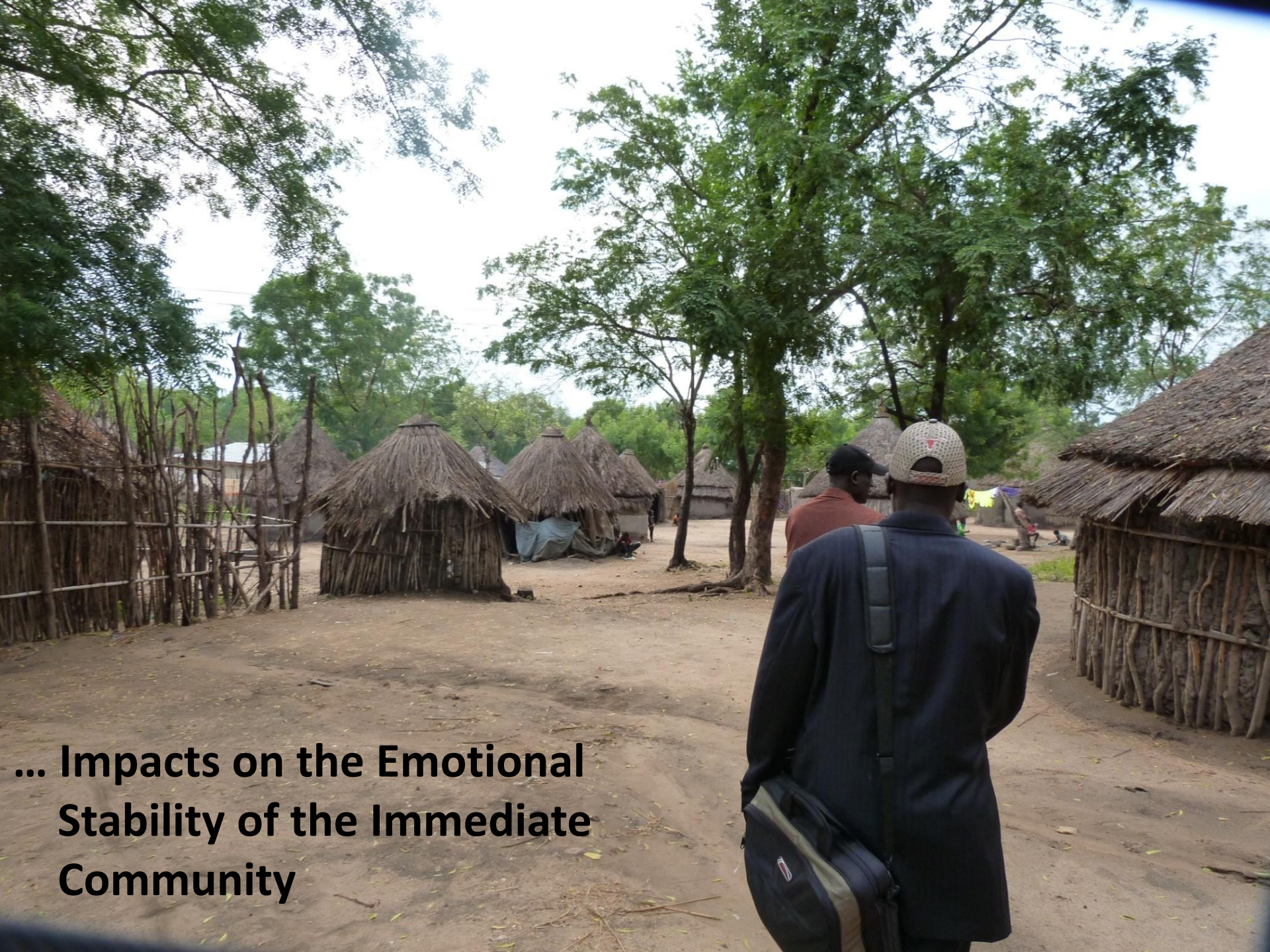

COMPARISON OF MALARIA PREVALENCE BY MONTHS 2005/2006
1650
1500
1350
1200
1050
900
750
600
450
300
150
0
CASES
J A S O N D J F M A M J
MONTHS

Burden on the Medical Systems

40% of healthcare investments in more than 100 affected countries are used to treat malaria

(Role Back Malaria Partnership 2008)


Sickness and Death Due To Malaria
Impacts Emotionally on the Well-Being
of the Family



… Impacts on the Emotional Stability of the Immediate Community

Economic Impact

Lost Productivity & Economic Growth
US 12 Billion Annually
(Global Malaria Action Plan)

Pestalto

MALARIA VECTORS

The primary vector is the female *Anopheles* mosquito (Balkew et al, 2010)

Species include: ***arabiensis***
pharoensis
funestus
nili
(WHO, 2010)

Adults are recognized by their "tail in the air" posture, dappled wings in most tropical species and long pair of palps beside the proboscis in the female.

As in other mosquitoes only the females bite and they use the proteins from a blood meal to produce a batch of eggs. These are laid in relatively clean water, such as in marshes, puddles, irrigation water, etc.


6


1


2


5


4


3

Anopheles larva

Unlike other mosquito larvae, those of Anopheles float parallel to the water surface. They develop through 4 larval instars to a short lived, motile pupal stage. The whole process from egg to emergence of the adult from the pupa takes little more than a week at tropical temperatures.

Anopheles Female Feeding Activities

Individuals of most female tropical anopheline species can survive to take 3 to 4 blood meals and thus initiate new cycles of egg development.

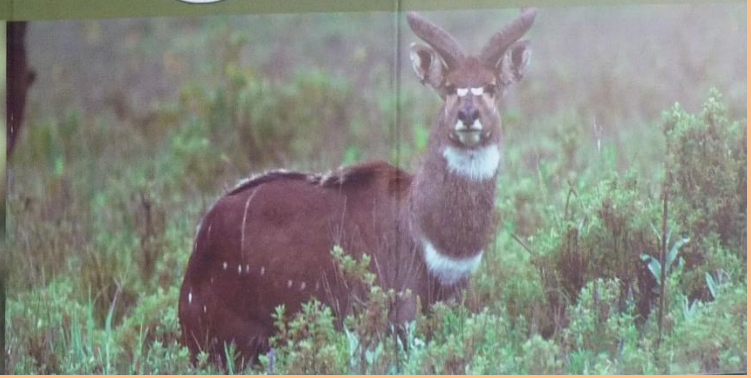
REASONS FOR RESURGANCE OF MALARIA OVER THE PAST 50 YEARS

- End of the colonial period & political stability
- Infrastructure and financing was not uniformly sustained
- Adverse economic conditions and policies of decentralization resulted in the deterioration of health systems
- Chemotherapy was the only anti-malaria intervention left in place
- Drug resistance

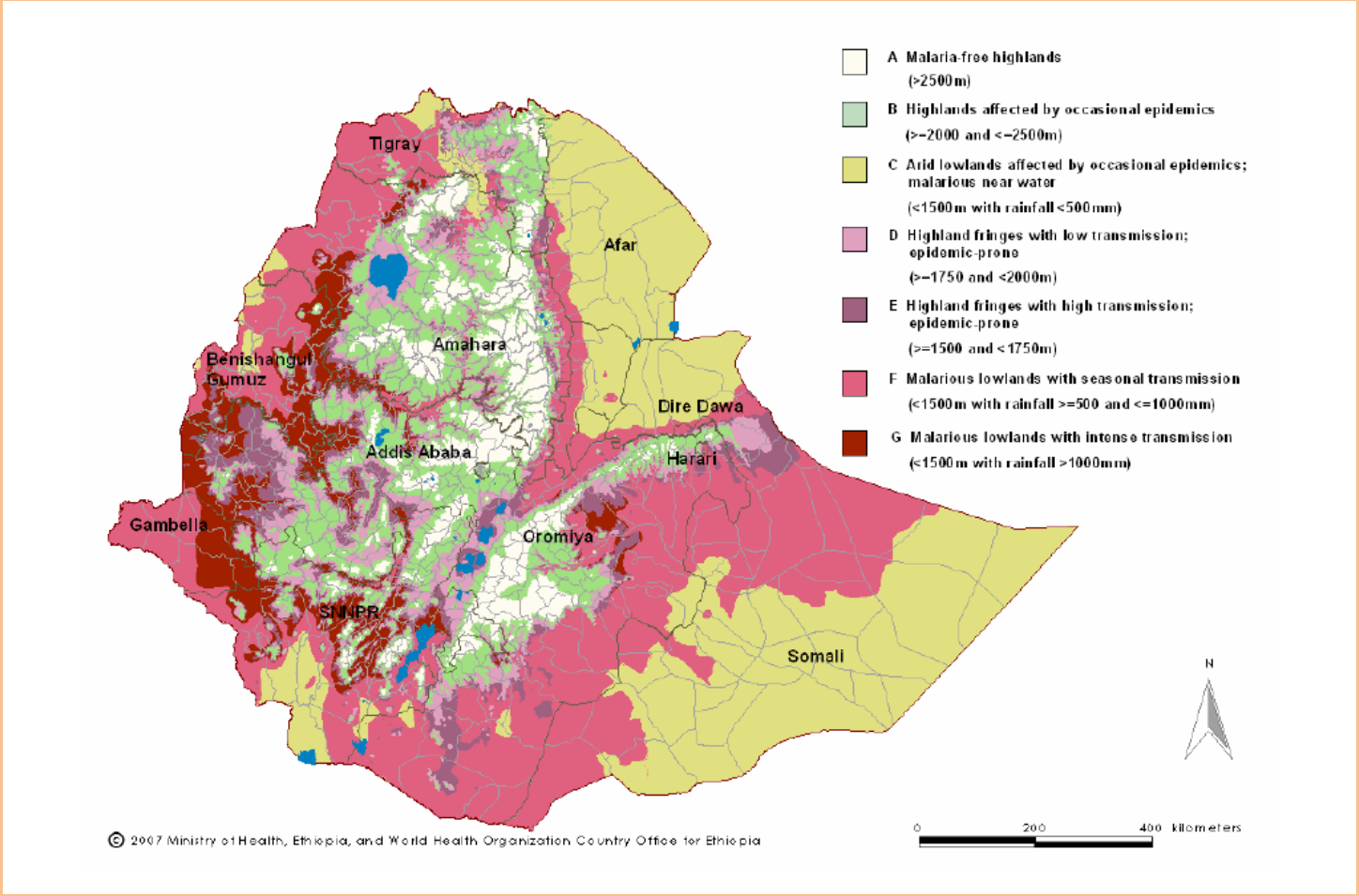
WELCOME TO ETHIOPIA

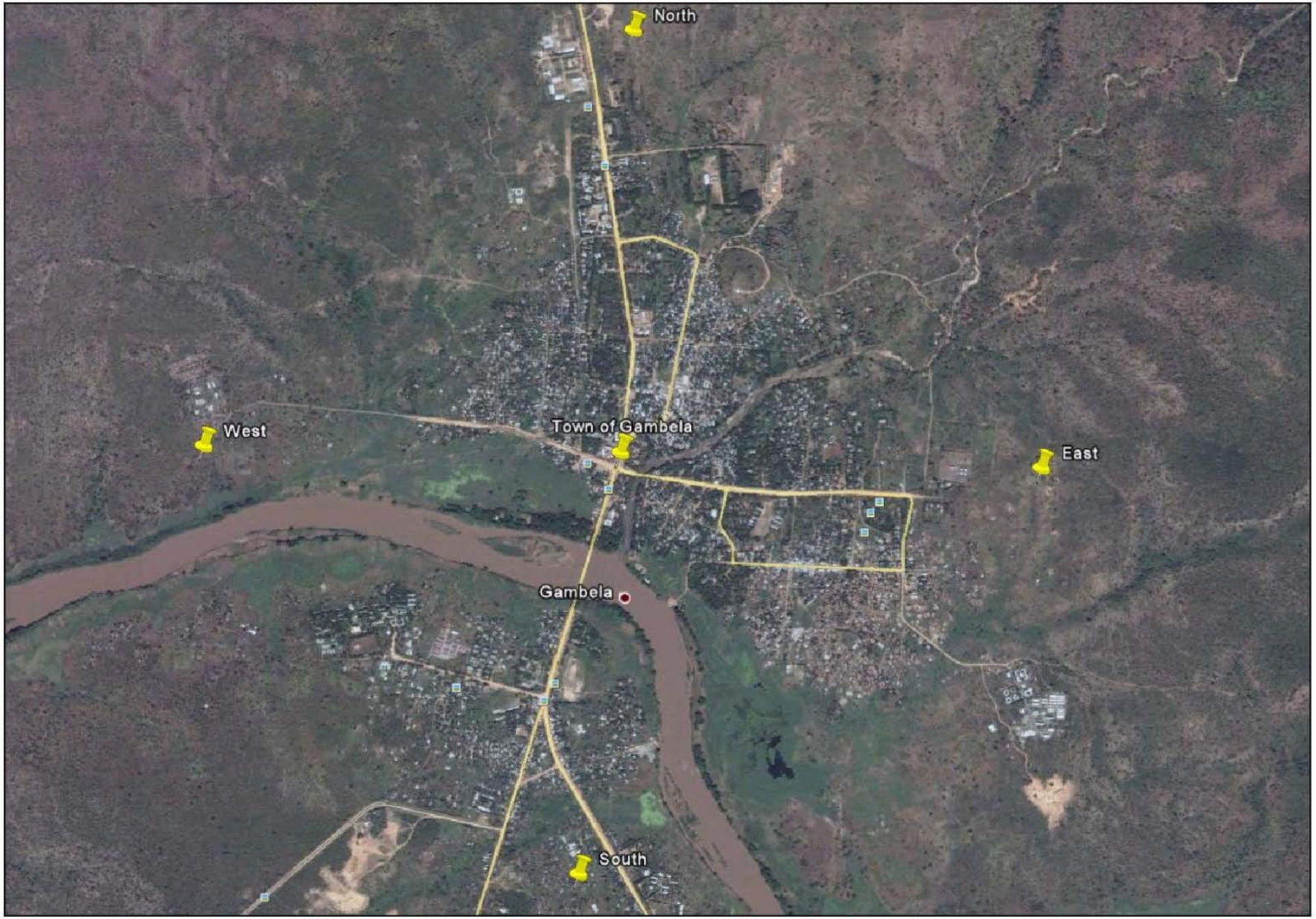
Ethiopian
የኢትዮጵያ
THE NEW SPIRIT OF AFRICA

የኢትዮጵያ ኤርፖርቶች ድርጅት
ETHIOPIAN AIRPORTS ENTERPRISE



MALARIA DISTRIBUTION





Town of Gambella, Ethiopia

Pestalto Environmental Health Services Inc.
Images from : Google Earth , GeoEye 2010 Nov 11, 2010

Integrated Vector Management

Decision making process

set of actions to determine:

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- where,
- when,
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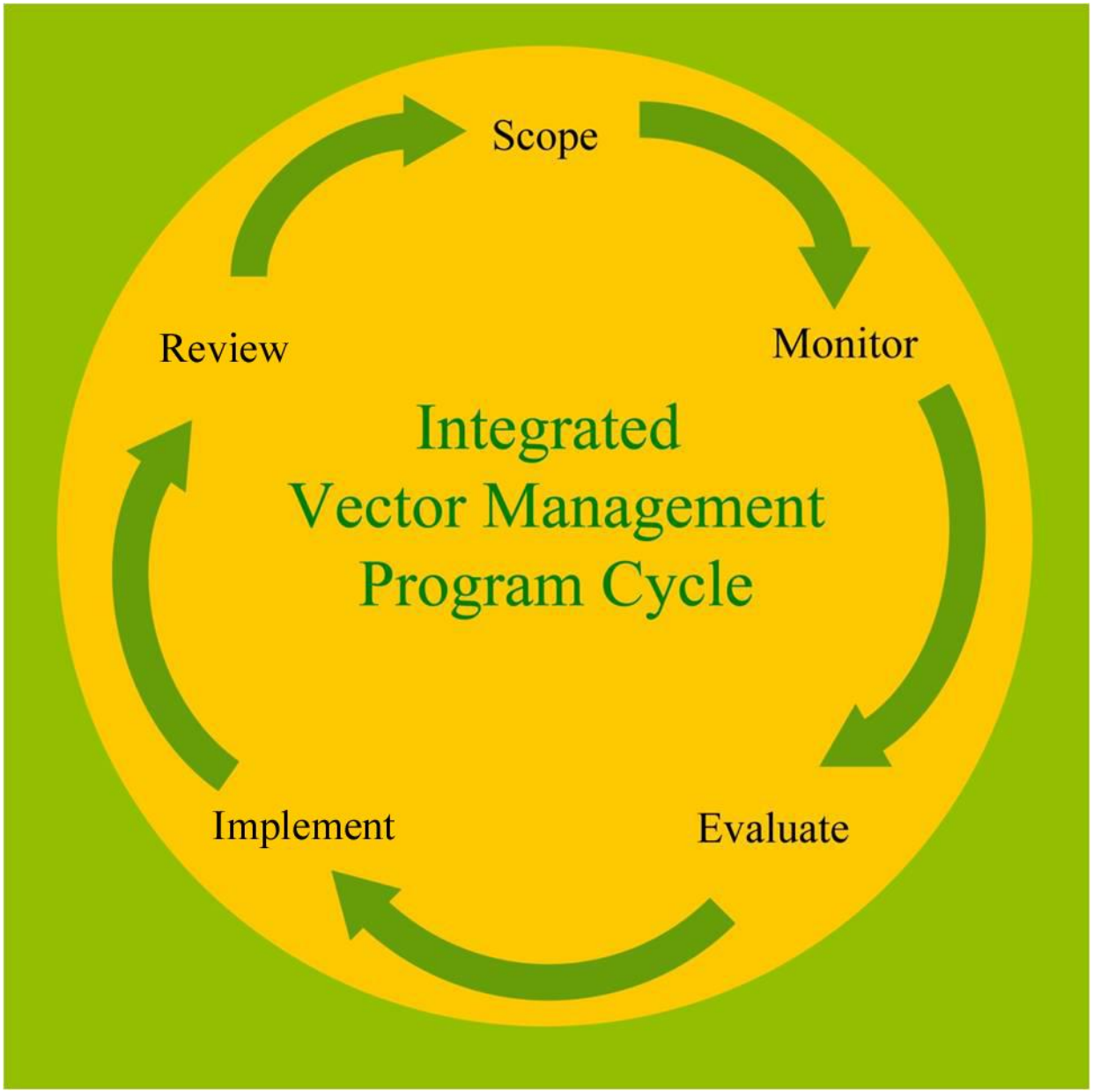
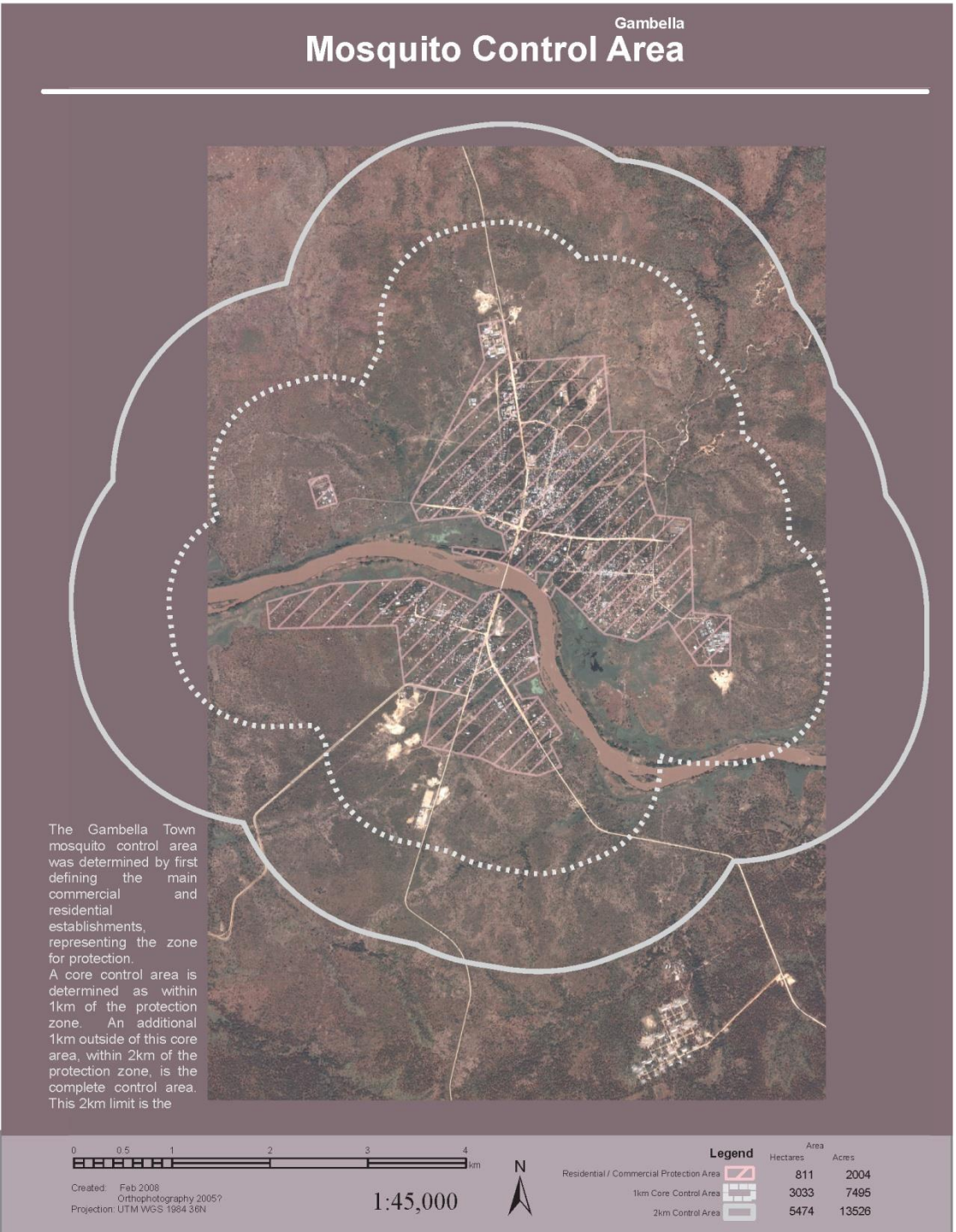
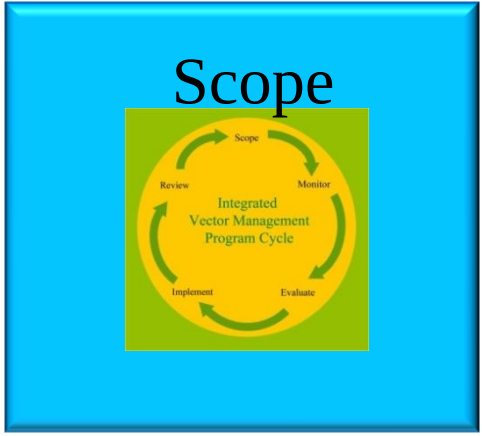
vectors are managed.

Works on a macro program level and micro operational.





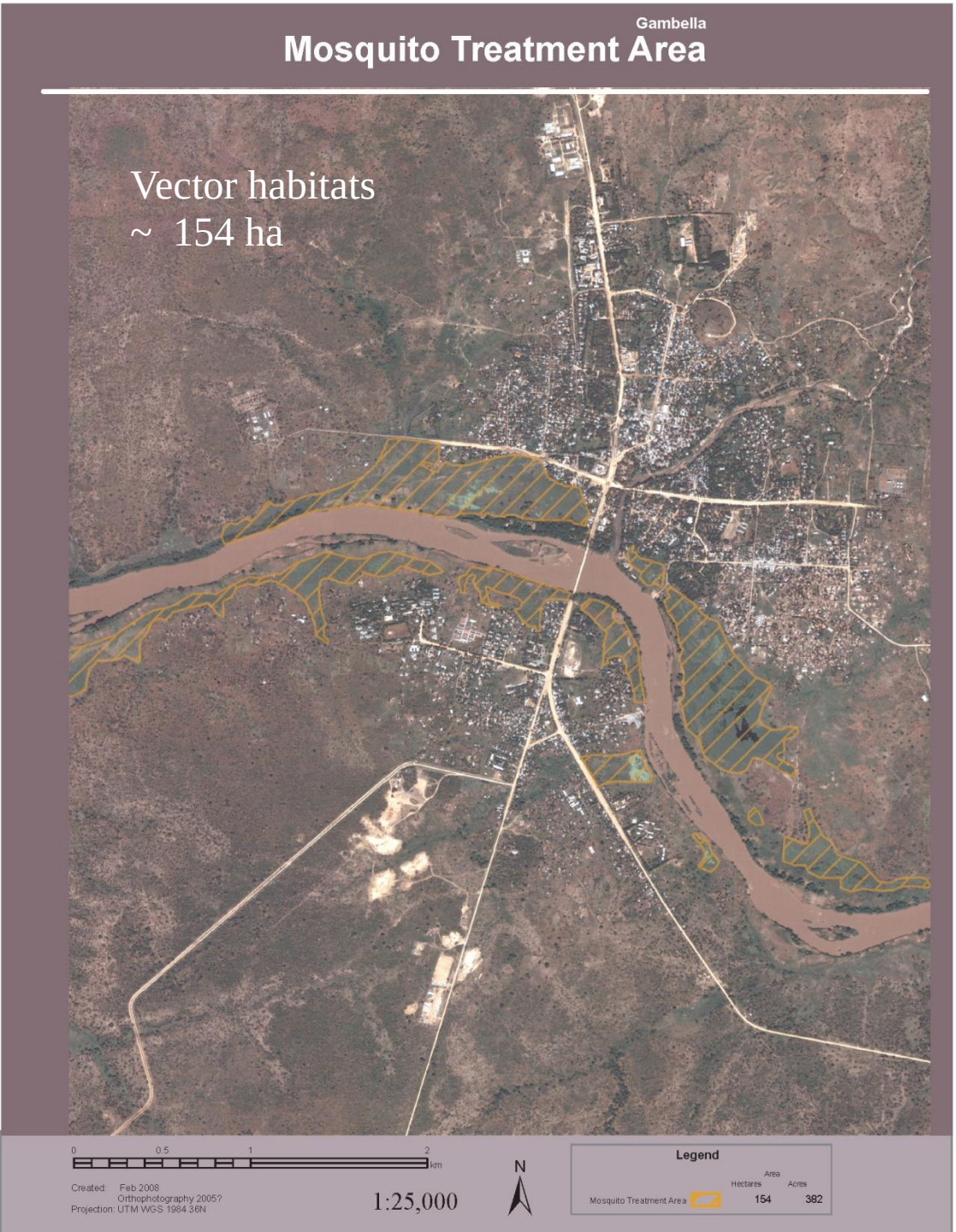


Goal:
To protect the inhabitants of Gambella Town from malaria through an Integrated Vector Management program.

Objective:
Reduce the incidence of malaria through larval control

Define protection area

Expand by mosquito flight range



Preliminary Assessment

Majority of the vectors are likely coming from the seasonally flooded areas adjacent to the Baro River

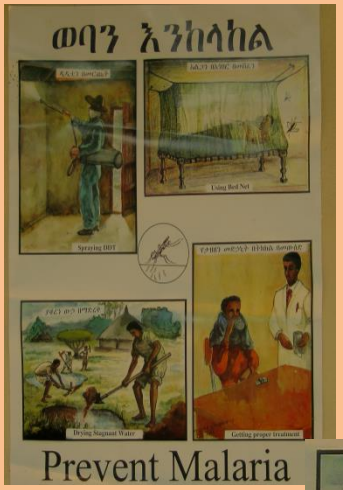
Some sampling confirms the presence of Anopheles in these areas.

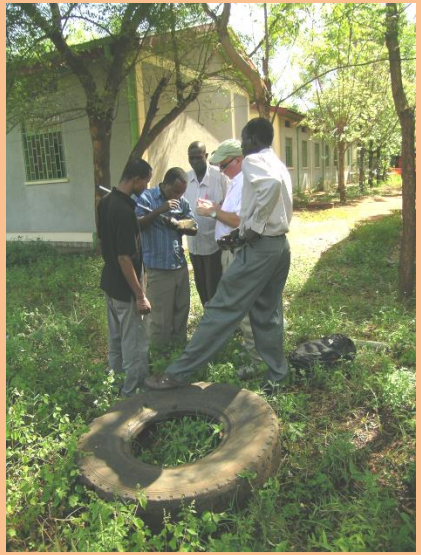
Remediation

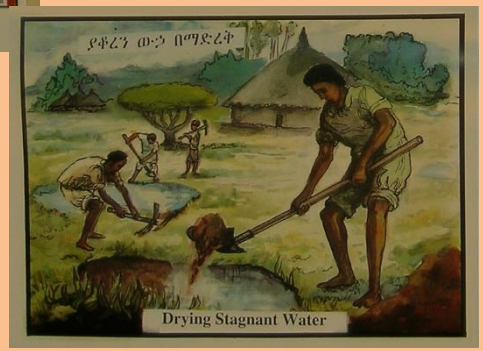
- Alter mosquito breeding habitat to create unfavourable cond
- More permanent long-term solution
- Small scale and Large scale realms

Small scale

- Public awareness campaign
- Surveillance and education







Large scale

➢Other community benefits

- conversion to high quality agricultural lands
- control of other disease vectors

➢Still may require maintenance

➢Still may require larvaciding, but to a much lesser extent

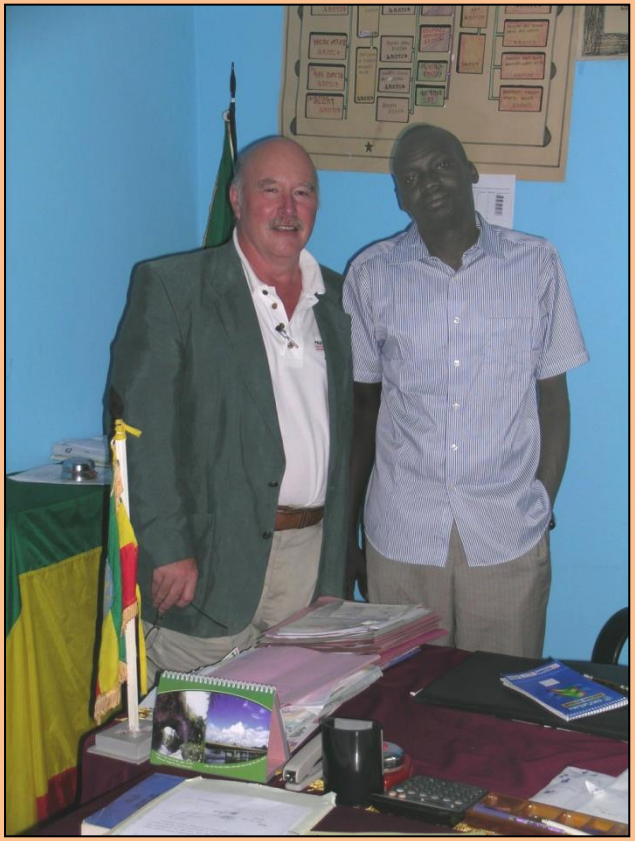
➢Environmental sensibility

➢High cost for design and implementation


147°
02/16/2008


236°
02/16/2008


ROUTE H



የጋምቤላ ህዝቦች ብሔራዊ ክልላዊ መንግስት ጤና ቢሮ
Gambella People's National Regional State
Health Bureau
ጋምቤላ
Gambella

ቀን Date 23/07/2002 ዓ.ም
ቁጥር Ref.No 16/1596/ጤቢሮ

To PEST ALTO Environmental Health Service
Dr. Barry Tyler

President Mosquito Vector Control Consultant
Canada

Sub: - Agreement on Drafted Proposal

We have agreed on the Draft proposal /"Take Back The Night" Malaria Vector Larviciding Program in Gambella town /. Therefore, Gambella National Regional States Health Bureau is requesting your organization to start the proposed larviciding activities in the town as the committee accepted it before the rainy season. The name of the committee that agree on the draft proposal are as follows

1. Mr. Oman Ugud, Deputy Head, Health Sector
2. Eng. Olero Opio, Bureau Head, Town and Urban Development
3. Mr. Siman Turial, Expert, Security and Justice Adm. Affairs
4. Mr. Getachew Bati, Department Head, Malaria and other vector born diseases prevention and control
5. Mr. Hailu Turura, Team Leader, Vector Biology Control
6. Mr. Rhamsy Shwoll, Expert, Epidemiology & diagnostic
7. Dr. Kibebe, Gambella Hospital
8. Dr. Mininlik, Gambella Hospital

Thank you in advance!

Cc.

-To Mr. Ouvry Robert
Canada

-To Regional Council office

-To Town & Urban Development Bureau
Gambella

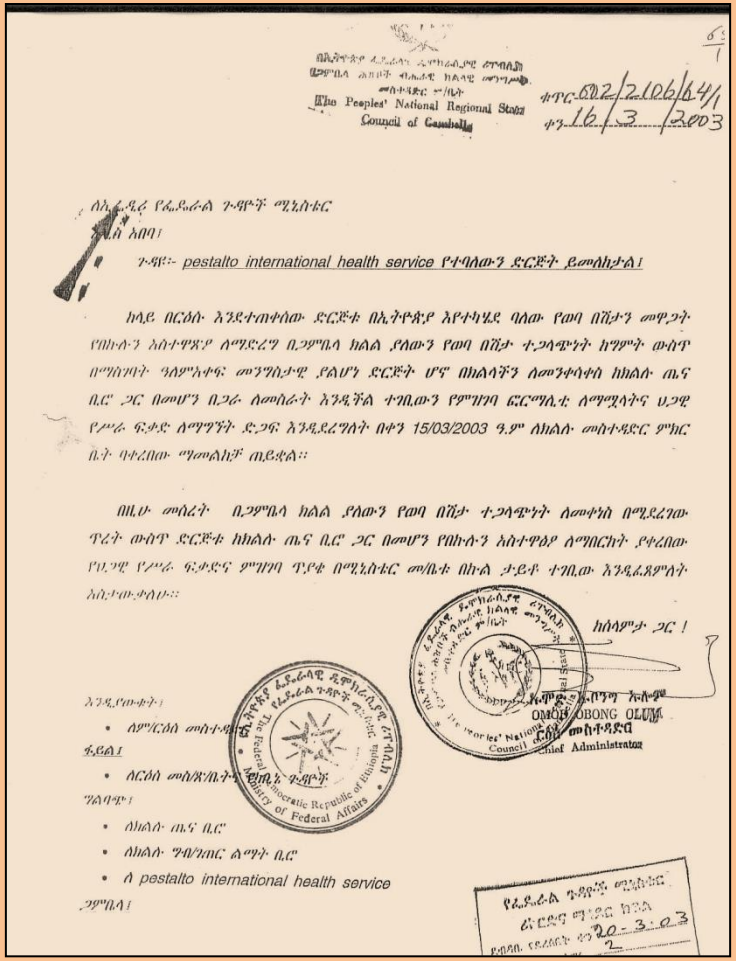
Gambella Peoples National Regional Government of Health Bureau

ኮር ፑኦች ቢሊው
KHOR PUOCH BILIEW
የጤና ቢሮ ሀላፊ
Head of Health Bureau

Address - P.O.BOX 109 Fax 07-510215 Tel 07- 510536 / 510138 / 510141 / 510142 / 510214 / 510538 / 510137 / 510569
Gambella

President Omod Obong Olum

The Peoples' National Regional State Council of Gambella



The Peoples' National Regional State Council of Gambella

ለአቶ አበባ፣

ጉዳዩ፡- pestalto international health service የተባለውን ድርጅት ይመለከታል፣

ከላይ በርዕሱ እንደተጠቀሰው ድርጅቱ በኢትዮጵያ እየተካሄደ ባለው የወባ በሽታን መዋጋት የበኩሉን አስተዋጽኦ ለማድረግ በጋምቤላ ክልል ያለውን የወባ በሽታ ተጋላጭነት ከሚመት ውስጥ በማስገባት ዓለምአቀፍ መንግስታዊ ያልሆነ ድርጅት ሆኖ በክልላችን ለመንቀሳቀስ ከክልሉ ጤና ቢሮ ጋር በመሆን በጋራ ለመስራት እንዲችል ተገቢውን የምዝገባ ፎርማሊቲ ለማሟላትና ህጋዊ የሥራ ፍቃድ ለማግኘት ድጋፍ እንዲደረግለት በቀን 15/03/2003 ዓ.ም ለክልሉ መስተዳድር ምክር ቤት ባቀረበው ማመልከቻ ጠይቋል።

በዚሁ መሰረት በጋምቤላ ክልል ያለውን የወባ በሽታ ተጋላጭነት ለመቀነስ በሚደረገው ጥረት ውስጥ ድርጅቱ ከክልሉ ጤና ቢሮ ጋር በመሆን የበኩሉን አስተዋፅዖ ለማበርከት ያቀረበው የህጋዊ የሥራ ፍቃድና ምዝገባ ጥያቄ በሚኒስቴር መ/ቤቱ በኩል ታይቶ ተገቢው እንዲፈጸምለት አስታውቀለሁ።

ከሰላምታ ጋር !

OMOD OBONG OLUM

Chief Administrator

እንዲያውቁት፣

- ለምርዕስ መስተዳ
ፋይል፣
- ለርዕሰ መስ/ጽ/ቤት
ግልባጭ፣
- ለክልሉ ጤና ቢሮ
- ለክልሉ ግብ/ጠር ልማት ቢሮ
- ለ pestalto international health service
ጋምቤላ፣

በኢትዮጵያ ፌዴራላዊ ዲሞክራሲያዊ ሪፐብሊክ
የፌዴራል ጉዳዮች ሚኒስቴር
The Federal Democratic Republic of Ethiopia
Ministry of Federal Affairs

ቁጥር Ref. No. ዘ1-00/ክ12-2

ቀን Date 21 ህዳር 2003

ለበጎ አድራጐት ድርጅቶችና ማህበራት ኤጀንሲ
አዲስ አበባ

ጉዳዩ፡- Pestalto international health Service የተባለውን ድርጅት ይመለከታል

በርዕሱ የተጠቀሰው ድርጅት በጋምቤላ ክልል ውስጥ ያለውን የወባ በሽታ ተጋላጭነት ለመዋጋት ዓለም አቀፍ መንግስታዊ ያልሆነ ድርጅት ሆኖ በክልሉ ለመንቀሳቀስ ከክልሉ ቢሮ ጋር በመሆን በጋራ ለመስራት እንዲችል ተገቢውን የምዝገባ ፎርማሊቲ በማሟላትና ህጋዊ የስራ ፈቃድ ለማግኘት ድጋፍ እንዲደረግለት በ15/3/2003 ዓ.ም በተጻፈ ማመልከቻ የክልሉን መስተዳድር ጠይቋል፡፡

በመሆኑም ኤጀንሲ በተሰጠው ህጋዊ ስልጣን መሰረት የክልሉ ፈላጭት መሆኑን በመረዳት ለተጠቀሰው ድርጅት ተገቢውን ምላሽ እንዲሰጠው እያሳሰብን ክልሉ የላከውን ደብዳቤ አንድ ገጽ ኮፒ ከዚህ ጋር አያይዘን የላክን መሆኑን እንገልጻለን፡፡

ከሠላምታ ጋር

ፋንታዬ ገሞቹኝ
ለሚኒስትር ጽ/ቤት የህግ አማካሪ