

From One Health to Eco-health



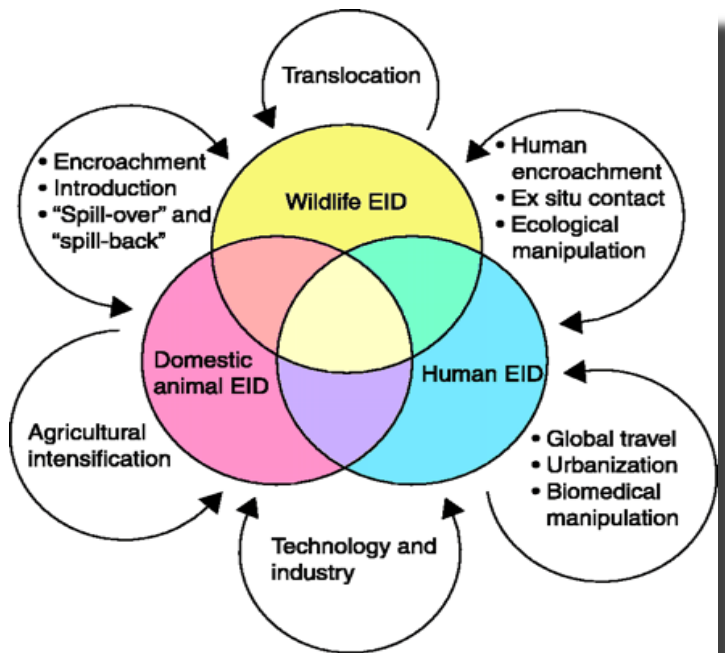
Thomas R. Gillespie

Emory University and Rollins School of Public Health

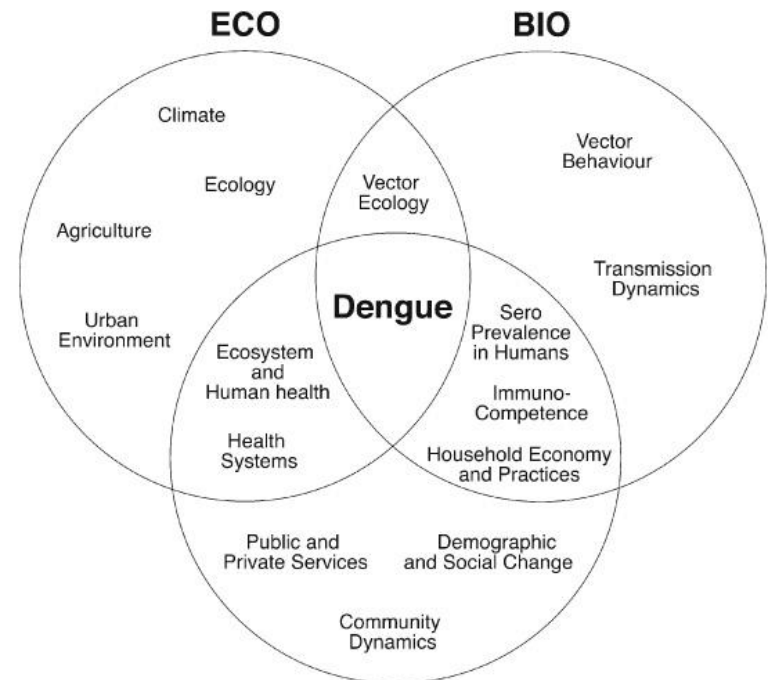
thomas.gillespie@emory.edu

Eco-health:

Focuses on interactions of host, pathogen and environmental factors in context of anthropogenically altered, dynamic ecosystems



Daszak et al. 2000



SOCIAL

IDRC 2012

Integrated Approach

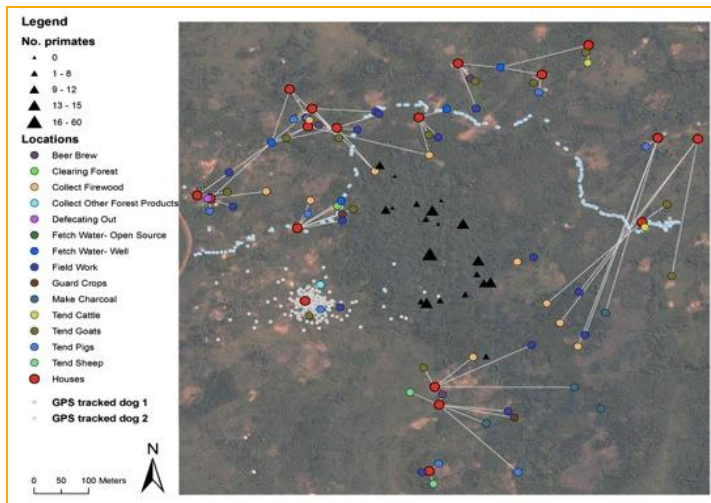
Epidemiological & Socio-Ecological Survey



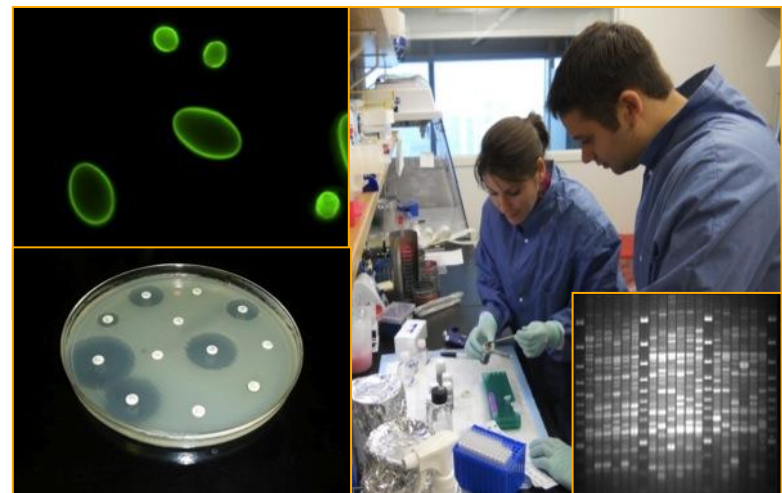
Observational data



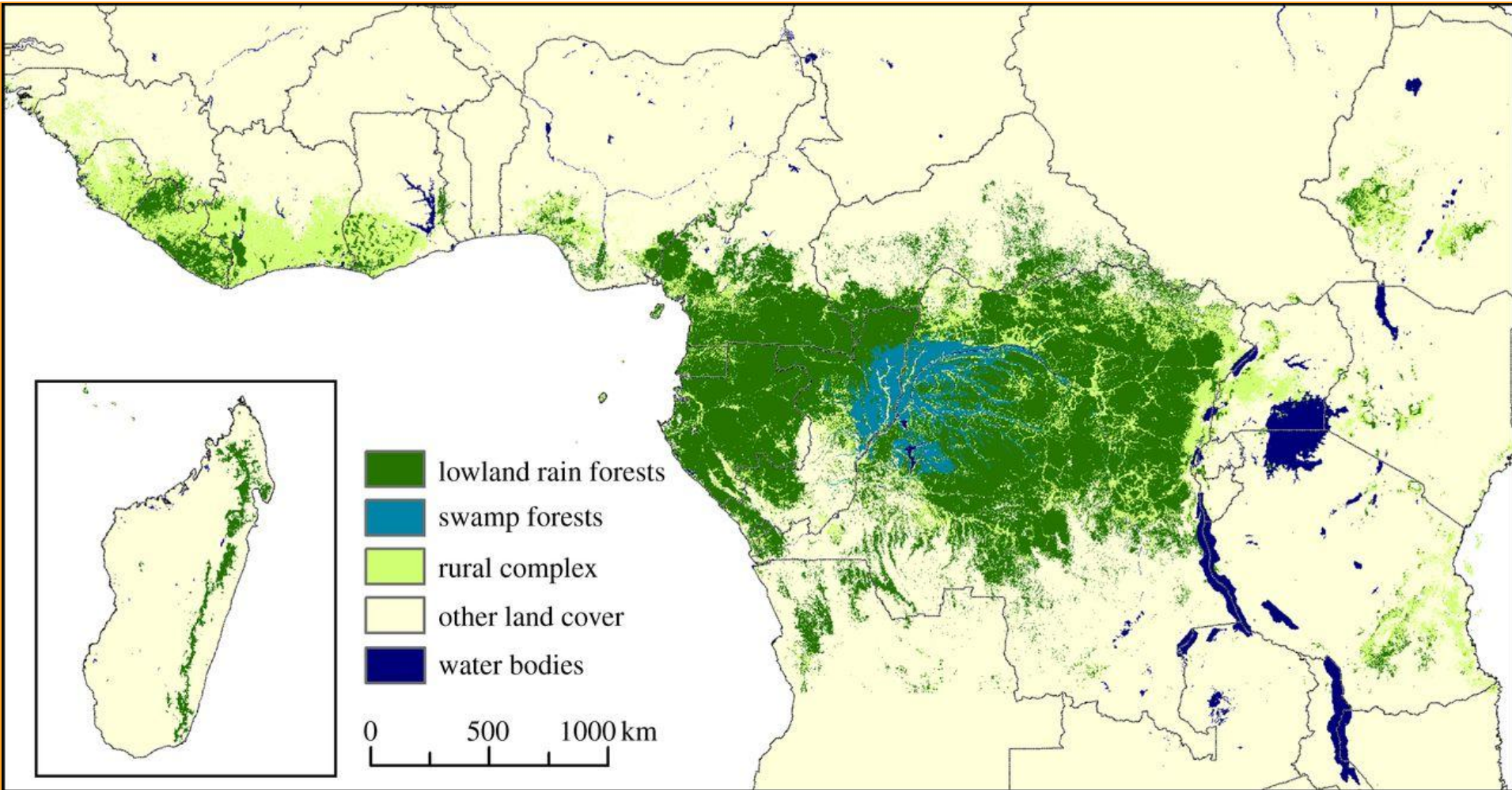
Spatial Analyses



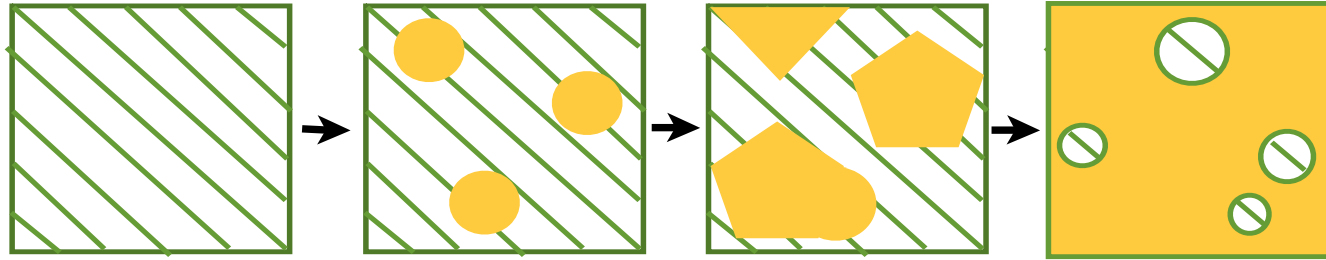
Infectious Disease Diagnostics / Characterization



African forest cover and the expanding rural complex



Disturbance Gradient



Intact landscape

Formation of a few isolated modified patches

Mix of large areas of connected modified landscape & intact vegetation

Isolated patches of original habitat with heavily modified matrix

Goulougo Triangle, Republic of Congo

Gombe National Park, Tanzania

Legend

Fecal Samples:
 ◻ Negative **S. stercoralis**
 ◻ Negative **S. stercoralis**

Tree Samples:
 ◻ Observation **Gathering**
 ◻ Feces **Gun shot**
 ◻ Vocalization **Machete cut**
 ◻ Camp site **Machine noise**
 ◻ Kabo Concession Layers
 — Sampling transects

Zone D
S. stercoralis infection
 Feces:
 Gorilla: 8% (4/50)
 Chimpanzee: 0% (0/66)
 Trees: 28% (9/32)

Zone B1
S. stercoralis infection
 Feces:
 Gorilla: 0% (0/84)
 Chimpanzee: 0% (0/66)
 Trees: 0% (0/24)

Zone C
S. stercoralis infection
 Feces:
 Gorilla: no feces found
 Chimpanzee: 0% (0/12)
 Trees: 0% (0/14)

CHIMPANZEE DAILY HEALTH SHEET
 (To be filled out for every 8 research targets plus any other thing found!!)
 1. Shiny name (for sample) _____ Target shiny name (for 8 research only)
 2. Shiny name (for watch) _____ Target shiny name (for 8 research only)
 3. Shiny name (for watch) _____ Target shiny name (for 8 research only)

CHIMP BEHAVIOUR (tick the appropriate):
 Development: Normal _____ Low than normal _____ Not at all _____
 Feeding: Normal _____ Low than normal _____ Not at all _____
 Playing: Normal _____ Low than normal _____ Not at all _____
 Resting: Normal _____ More than normal _____ Excessively _____

GENERAL BODY CONDITION (tick the appropriate):
 Weight: Normal _____ Thin _____ Very thin _____
 Hair: Normal _____ Hair matted _____ Wound/Wet _____ Sweaty/SM _____
 Mark: Normal _____ Hair matted _____ Wound/Wet _____ Sweaty/SM _____
 (Mark the body area on the picture below with corresponding abbreviation: for wounds, put W, etc.)

LAMENESS: If lameness is present, tick the appropriate here:
 Front limb: left _____ right _____ Front limb: left _____ right _____

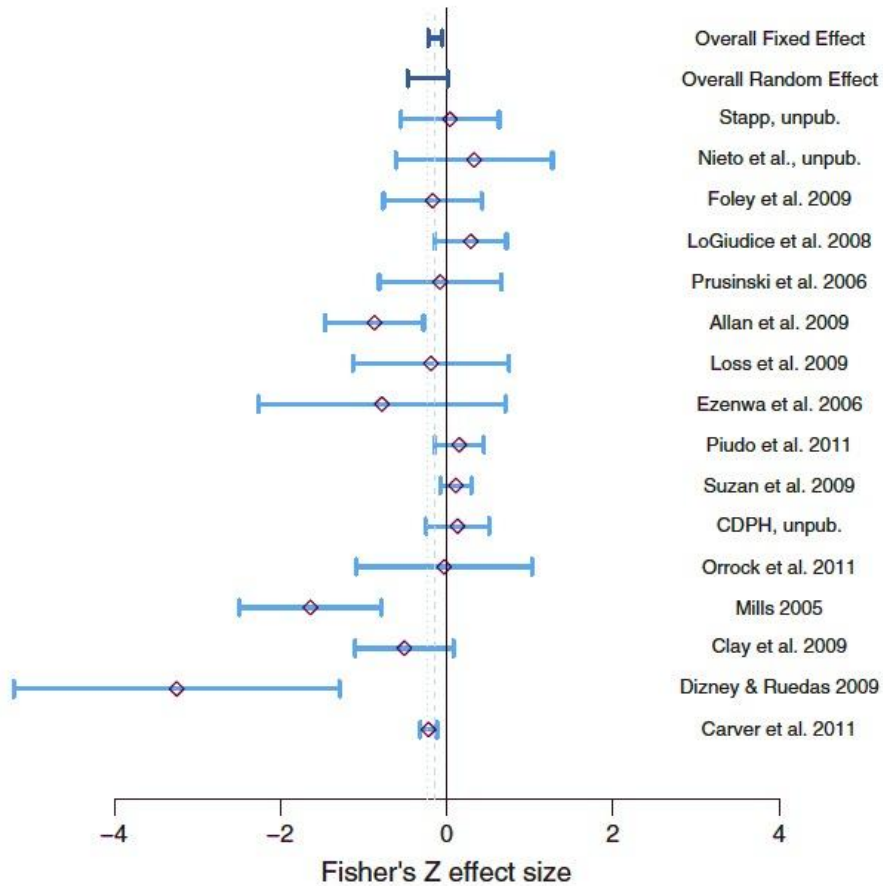
STECALS:
 Number of defecations per hour:
 Colour: White _____ Yellow _____ Green _____ Red _____ Black _____
 Consistency: Hard _____ Soft _____ Watery _____

COOKING: Not at all _____ 1-5 per hour _____ 5-10 per hour _____ all per hour _____
SMOKING: Not at all _____ 1-2 per hour _____ 5-10 per hour _____ all per hour _____
BURNING NOISE: Not at all _____ Some _____ A lot _____ (please collect sample)

SAMPLES COLLECTED (tick the appropriate):
 Urine _____ Faeces _____ Saliva _____ Other _____
 (No sample collected if space given empty)

Fig. 4. Field health-monitoring check-sheet normally in use at Gombe as part of daily field data collection.

Relationships between biodiversity and disease



Biodiversity  Infection ?



Land Use Change and Disease Working Group



PATCH SPECIES

$$\frac{dS_P}{dt} = N_P b_P \left(1 - \frac{N_P k_P}{f}\right) - \left(\frac{\beta_{PP} S_P I_P}{N_P^K} + \frac{\varepsilon \beta_{PM} S_P I_P}{(N_P + \varepsilon N_M)^K}\right) + \gamma_P R_P - d_P S_P$$

$$\frac{dI_P}{dt} = \frac{\beta_{PP} S_P I_P}{N_P^K} + \frac{\varepsilon \beta_{PM} S_P I_P}{(N_P + \varepsilon N_M)^K} - (\alpha_P + d_P + \sigma_P) I_P$$

$$\frac{dR_P}{dt} = \sigma_P I_P - (d_P + \gamma_P) R_P$$

MATRIX SPECIES

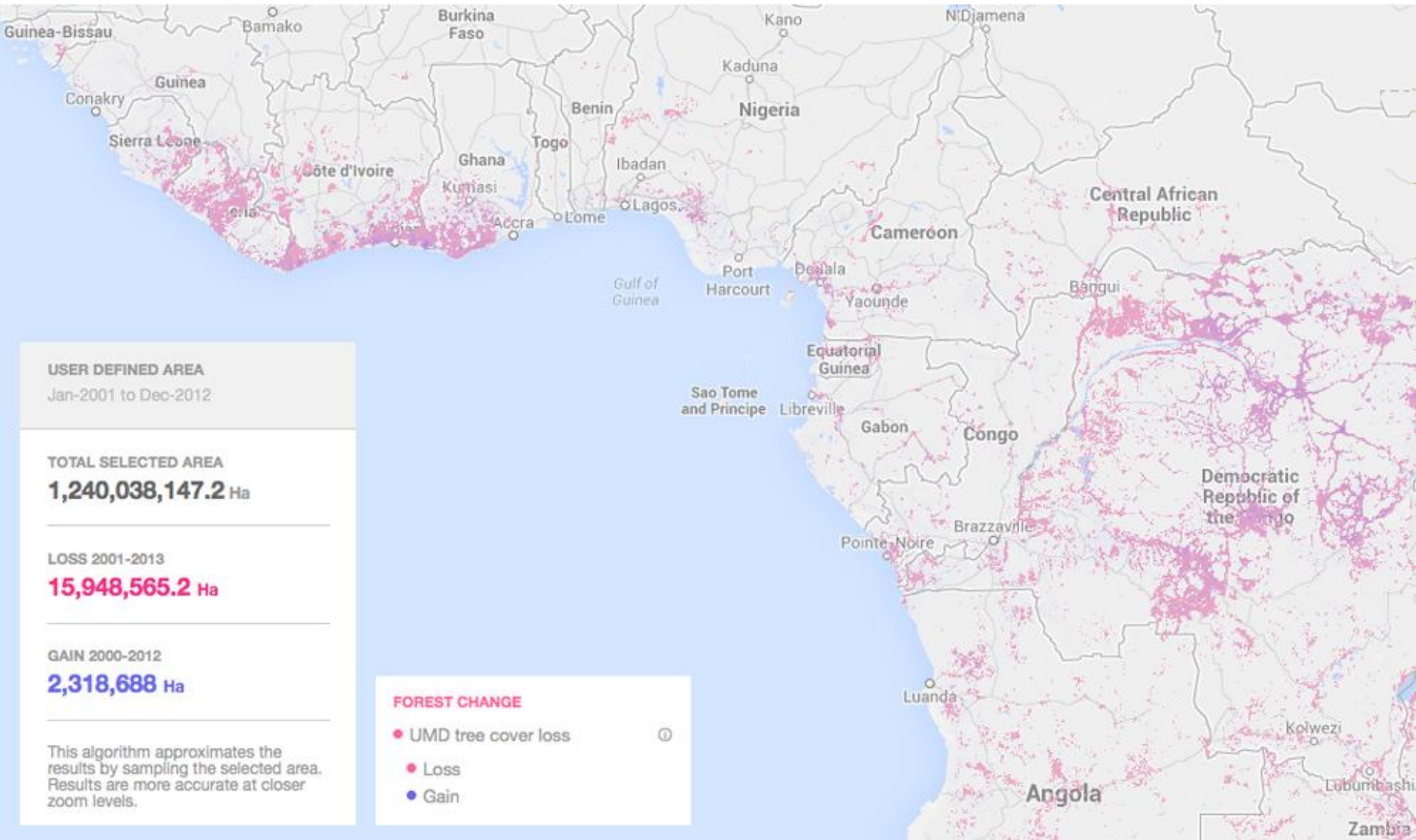
$$\frac{dS_M}{dt} = N_M b_M \left(1 - \frac{N_M k_M}{1.5 - f}\right) - \left(\frac{\beta_{MM} S_M I_M}{N_M^K} + \frac{\varepsilon \beta_{MP} S_M I_M}{(N_M + \varepsilon N_P)^K}\right) + \gamma_M R_M - d_M S_M$$

$$\frac{dI_M}{dt} = \frac{\beta_{MM} S_M I_M}{N_M^K} + \frac{\varepsilon \beta_{MP} S_M I_M}{(N_M + \varepsilon N_P)^K} - (\alpha_M + d_M + \sigma_M) I_M$$

$$\frac{dR_M}{dt} = \sigma_M I_M - (d_M + \gamma_M) R_M$$



Ebola and Eco-health



Perturbation of bat communities

