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# An Integrated GIS Model of Bovine Tuberculosis in African Buffalo (Syncerus caffer): Exploring Management Options in Kruger National Park, South Africa
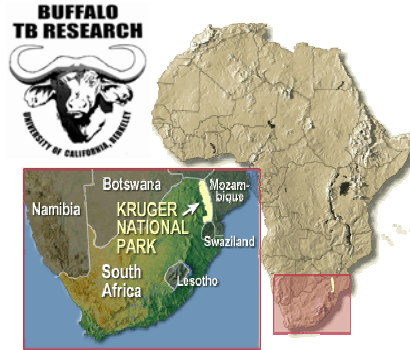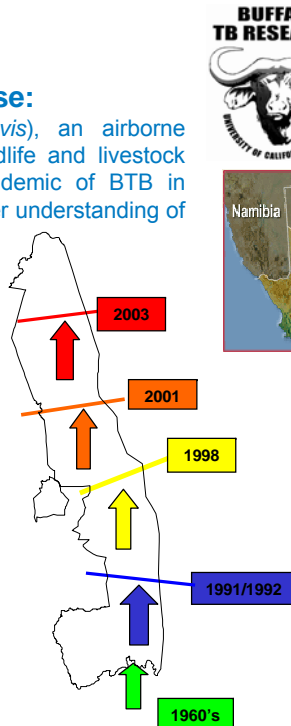
## OVERVIEW

**A re-emerging infectious disease:**
Bovine tuberculosis (*Mycobacterium bovis*), an airborne bacterial pathogen, is re-emerging in wildlife and livestock worldwide. We study a slow-moving epidemic of BTB in buffalo (*Syncerus caffer*) to develop a better understanding of disease spread in structured populations.

Prevalence is increasing in Kruger; the epidemic front is moving northward from its point of introduction from cattle in the south. Buffalo are a reservoir host, maintaining the disease at high prevalence (~60%), while predators such as lions and leopards appear to be spill-over hosts. As an exotic disease, managers would like to control or eradicate this disease via culling, vaccination, or a combination of the two.



**Bovine Tuberculosis is advancing northward in Kruger National Park**

(map markers: 2003, 2001, 1998, 1991/1992, 1960's)

**BUFFALO TB RESEARCH**
UNIVERSITY OF CALIFORNIA, BERKELEY



Namibia, Botswana, Mozambique, **KRUGER NATIONAL PARK**, Swaziland, South Africa, Lesotho

## GOAL AND APPLICATION

As one component of a larger project studying Bovine Tuberculosis, the goal of this project is to create a geographic information system (GIS) to project model simulations of management strategies for this epidemic in Kruger. This GIS will elucidate the spatial characteristics of the epidemic through a spatially explicit individual based model comprising three main modeling components: demography, age-structured disease transmission and habitat-dependent herd movement. These components will be derived from analyses of field data from multiple studies. Management strategies such as culling or vaccination will be modeled as modifications of these components and the results demonstrated in a GIS.

## RESEARCH HIGHLIGHTS

**Breeding, Movement and Habitat Selection:**
Using data collected from 1993-2001 in Klaserie Private Nature Reserve, adjoining Kruger, we found that births correlate to a one month lag with predicted grass biomass, suggesting that *conception* occurs at biomass peaks. Using remotely sensed vegetation data (ΣNDVI) we found that conception and biomass peaks also coincide with high ΣNDVI values.
**This finding helps us define a demographic response to a habitat cue in a GIS.**

**Buffalo primarily use riverine habitat; in the dry season this is intensely focused on the perennial portion of the river**

**Dry**        **Wet**
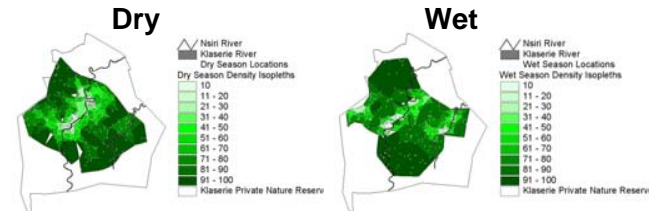


Buffalo also demonstrated selection for short woodland habitats and areas within 1 km of water within Klaserie.

**10-day range distance (blue)[1] and area (red)[2] were greater in the dry season than wet.**



[1] t = 4.21, df = 75.57, p<0.0001

[2] t = 5.00, df = 65.80, p<0.0001
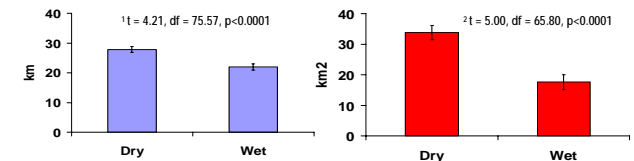
**These findings highlight the importance of water sources and seasonality to buffalo movement patterns**

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