

Appendix 1

Table A1.1. This table shows examples of disease outbreaks in southern African protected areas for each of the case study diseases considered in this study. For each case study disease, we give the protected area(s) where the focal disease had an impact, as well as a short description of what this impact was. “NP” or “NPs” denote a National Park and National Parks, respectively and “GR” denotes a Game Reserve.

Disease	Protected Area	Disease Outbreak	Impact	Reference
Foot and Mouth Disease	Kruger NP, South Africa	In 2001/2002 heavy floods resulted in the destruction of a fence, cloven-hooved carriers came into contact with domestic stock as a result.	Significant production losses in domestic stock when more than 15,000 cattle were slaughtered	Thomson et al. 2003
	Moremi NP, Botswana, Hwange NP, Zimbabwe (examples)	Several outbreaks of various magnitudes in the earlier part of the 1900s	Development of new legislation that requires game-proof fences around protected areas, as well as other infrastructural and permitting measures to restrict movement of cloven-hoofed animals.	See Cumming et al. 2015a for a history of policies, Vosloo et al. 2002 for a description of different outbreaks, Schoones et al. 2008.

Anthrax	Bwabwata, Mangetti and Etosha NPs, Namibia; Central Kalahari & Khutse GRs, Botswana	Several outbreaks of various magnitudes in the earlier part of the 1900s	Farmers around protected areas with buffalo behind the "red line" are not able to export their beef. Areas south of the red line are unable to market themselves as "big five" destinations, as the game control fences dictate they remain free of buffalo.	Schoones et al. 2008
	Kruger NP, South Africa	Several outbreaks of various magnitudes in the earlier part of the 1900s	Increased appreciation for the relevance of studies that track the movement behaviour of the free-living buffalo that are reservoirs of the FMD virus.	e.g. Ryan et al. 2006
	Etosha NP, Namibia; North and South Luangwa NPs, Zambia, Vaalbos, Kruger NPs, South Africa	Several outbreaks of various magnitudes between 1900 and 2011	Infection of livestock and humans in surrounding communities through direct contact or through consumption of infected animal tissue, leading to illness and death.	Hugh-Jones and Vos 2002, Hang'ombe et al. 2012, Simudaala et al. 2006

North Luangwa NP,
Zambia

Outbreak in 2011,
Incidences of Anthrax in
1990, 1991-1998.

Local perceptions of the protected areas,
and eating meat from it are affected by
both Anthrax outbreaks and enforcement
of regulatory control measures of the
disease.

Hang'ombe et al. 2012,
Siamudaala et al. 2006

South Luangwa NP,
Zambia

Outbreak in 1987, 1997

Tourist lodges in South Luangwa
National Park are located along the river
where anthrax deaths are common. Delay
in disposing off anthrax carcasses around
tourist centres such as lodges and
campsites exposed tourists to the
unpleasant and offending odour from the
decomposing carcasses. Burning of
carcasses within lodge premises exposed
tourists to smoke pollution. The presence
of carcasses along game viewing roads
compromised the aesthetic beauty of the
area and caused concern among the
tourists.

Siamudaala et al. 2005

Mana Pools NP,,
Zimbabwe; Etosha NP,
Namibia, Kruger NP,
South Africa

Several outbreaks of
various magnitudes
between 1900 and 2008

Social adaptations in the form of large
investments in research, resulting in
immunization programmes.

Turbull 1991, Beyer and
Turnbull 2009

Malaria	Kruger NP South Africa, Gorongosa NP, Mozambique, Hwange NP, Zimbabwe, Moremi NP, Botswana, Etosha NP, Namibia, Kafue NP, Zambia	Presence of risk to contract Malaria	Being declared a malaria area affects the continuity of an affected protected area as it becomes embedded into the system's memory.	Durrheim et al. 2001
	IsiMangaliso Wetland Park and Hluwe-Imfolozi GR, South Africa	1997 Malaria Outbreak	An outbreak of malaria decreased visitation rates to IsMangaliso and Hluwe-Imfolozi Nature reserves	Durrheim et al. 1998
	Kruger NP, South Africa	Presence of risk to contract Malaria	Extensive press coverage of South African epidemics, including malaria, appear to have negatively influenced the volume of tourism to the Kruger National Park	Durrheim et al. 2001

	Kafue-, Lochinvar- and Blue Lagoon NPs, Zambia	Presence of risk to contract Malaria	social adaptation has also taken to form of using government-supplied mosquito nets for other purposes, such as fishing, causing negative impacts on adjacent ecological communities	Haller & Merten 2008
	Hlane Game Sanctuary, Swaziland (example - many others)	Presence of risk to contract Malaria	Social adaptation has been evident in strategies to manage the disease through controlling mosquito numbers (e.g. spraying of dwellings with pesticides, reducing stagnant water areas) as well as preventing disease contraction (e.g. use of nets, repellents and suppressive or causal prophylactics)	O'Meara et al. 2010, Hackel & Carruthers 1993
Rabies	Hwange NP, Zimbabwe	1966 Outbreak	In the 1960s, domestic dogs were identified as the most likely source of rabies outbreaks in the Hwange National Park, which caused widespread mortality of wild dogs (Childes 1988), highlighting the potential influence of domestic animals on PA resilience	Childes 1988

	Etosha NP, Namibia; Madikwe GR, South Africa	1978, 1989, 1990 (Etosha); 1998 and 2002 (Madikwe)	Rabies have thwarted attempts to re-introduce endangered wild dogs in Etosha National Park, has resulted in two successive outbreaks in wild dog packs in Madikwe, South Africa (Hofmeyr et al., 2000 and Hofmeyr et al., 2004), and has been identified as the cause of the loss of five packs in Botswana (Woodroffe et al., 2004).	Hofmeyr et al. 2000, 2004, Scheepers and Ventske 1995
	Madikwe GR, South Africa	Following outbreaks in the 1990s	Multiple doses of expensive vaccines were needed to successfully protect wild dog pups from Rabies	Vial et al. 2006
Rift Valley Fever	Hwange NP, Zimbabwe; Kruger NP, South Africa	Several outbreaks in the 20th century	Protected areas are thought to act as reservoirs of RVF in several southern African Protected areas	Olive et al. 2012

Kalahari Gemsbok National Park, Namibia; Addo NP, South Africa	1975 Outbreak in South Africa	Human mortalities and illnesses have occurred during large outbreaks	Swanepoel and Paweska 2011
Kalahari Gemsbok NP, Namibia and Addo NPs, South Africa	1955, 1969, 1970, 1974-1976 Outbreaks	Extensive livestock losses (Angora goats and Cattle) led to decreased revenue and community perception	Swanepoel and Paweska 2012
Addo NP, South Africa	Previous recorder outbreaks of RVF (including one in 2010)	Travel advisory issue after suspected case of Rift Valley fever	Boshra et al. 2011

Canine Distemper	Chobe GR, Botswana, Etosha NP, Namibia	Several Outbreaks in the 1900s and early 2000s	Outbreaks of CDV have had devastating effects on lion, bat eared fox, hyena and wild dog populations in Southern African protected areas	Alexander et al. 1996, Bellan et al. 2012
	Chobe GR, Botswana	1994 Outbreak	The prevalence of CDV in domestic dogs found in communities surrounding protected areas provides a constant disease reservoir (Alexander et al. 1996), making the disease important for ecological memory.	Alexander et al. 1996
Trypanosomiasis	Gonarezhou NP, Zimbabwe (example)	With reference to eradication measures in the 1920s	Game elimination and widespread insecticide spraying have negatively impacted biotic and abiotic components of PA identity.	Cumming et al. 2015a, Welburn et al. 2006

<p>North and South Luangwa NPs, Zambia and Mana Pools NP, Zimbabwe</p>	<p>Several recorded cases in the 1900s and 2000s</p>	<p>Tourists visiting protecting areas in East and southern Africa have contracted Rhodesian human trypanosomosis; outbreaks are likely to affect tourist visitation rates to the affected protected areas.</p>	<p>Simarro et al. 2012</p>
<p>Hluhluwe Imfolozi NR, South Africa, South Luangwa NP, Zambia</p>	<p>Outbreaks in the 1980s and 1990s</p>	<p>Outbreaks of Trypanosomiasis results in losses of livestock and represent a major disservice to the rural poor</p>	<p>Kappmeier et al. 1998, Van de Bosch et al. 2006, Welde et al. 1989, Torr et al. 2012, Anderson et al. 2009</p>
<p>Matusadona NP, Zimbabwe</p>	<p>With reference to a reintroduction in 1984</p>	<p>Rhinos relocated died from Trypanosomiasis despite local populations not becoming diseased</p>	<p>Taylor 1986</p>