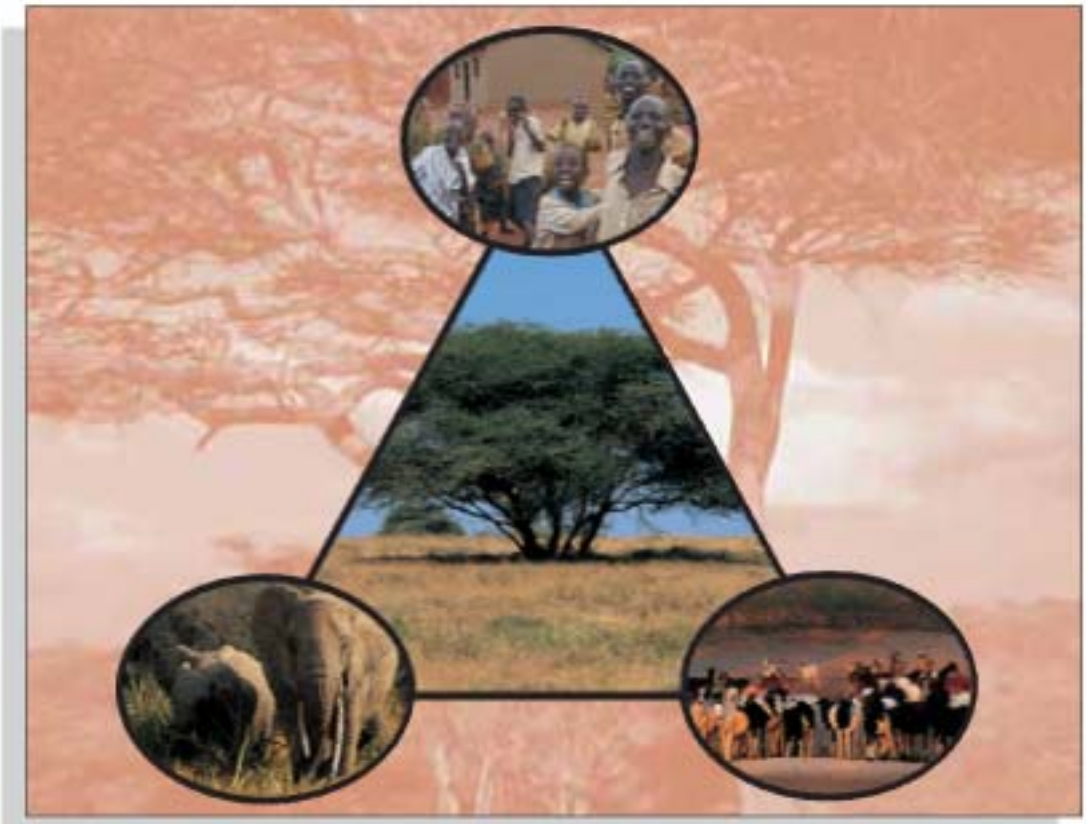
The IUCN Species Survival Commission

Conservation and Development Interventions at the Wildlife/Livestock Interface

Implications for Wildlife, Livestock and Human Health

Edited and compiled by Steven A. Osofsky

Associate Editors: Sarah Cleaveland, William B. Karesh, Michael D. Kock, Philip J. Nyhus, Lisa Starr and Angela Yang



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AHEAD invitees (or a good portion of them!) – Vth World Parks Congress – Durban, South Africa, September 2003

Angela Yang. Sincere apologies to anyone we may have inadvertently missed!

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Sincerely,

Steve Osofsky, DVM
Wildlife Conservation Society – Field Veterinary Program
Senior Policy Advisor, Wildlife Health

Abbreviations and Acronyms

AAAS	American Association for the Advancement of Science
ADMADE	Administrative Management Design for Game Management Areas
AE	adult equivalent
AGID	agar-gel immunodiffusion
AHEAD	Animal Health for the Environment And Development
AIDS	acquired immune deficiency syndrome
ASAL	arid and semi-arid lands
ASF	African swine fever
AU/CTTBD	African Union/Centre for Ticks and Tick-Borne Diseases
AU/IBAR	African Union/Interafrican Bureau for Animal Resources
AWF	African Wildlife Foundation
AZA	American Zoo and Aquarium Association
BIIT	blood infectivity incubation test
BINP	Bwindi Impenetrable National Park
BTB	bovine tuberculosis
CAHS	Community-based Animal Health Systems
CAHW	Community-based Animal Health Workers
CAMPFIRE	Communal Areas Management Program For Indigenous Resources
CAPE	Community-based Animal Health and Participatory Epidemiology
CBNRM	Community-Based Natural Resource Management
CBPP	contagious bovine pleuropneumonia
CCPP	contagious caprine pleuropneumonia
CI	Conservation International
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement
CITES	Convention on International Trade in Endangered Species
CONASA	Community-based Natural Resource Management and Sustainable Agriculture
CRB	Community Resource Board
DFID	Department For International Development
DNPWM	Department of National Parks and Wildlife Management
DRC	Democratic Republic of Congo
EAC	East African Community
ECF	East Coast fever (theileriasis)
EDD	Exotic Diseases Division
EIA	environmental impact assessment
EU	European Union
FAO	Food and Agriculture Organization (of the United Nations)
FEWS	Famine Early Warning System
FMD	foot and mouth disease
FVP	Field Veterinary Program
GATT	General Agreement on Tariffs and Trade
GDP	gross domestic product
GEF	Global Environment Facility
GIS	Geographic Information Systems

GLTFCA	Great Limpopo Transfrontier Conservation Area
GLTFP	Great Limpopo Transfrontier Park
GMA	Game Management Area
GR	Game Reserve
GREP	Global Rinderpest Eradication Programme
GTZ	Gesellschaft für Technische Zusammenarbeit
ha	hectare
HIV	human immunodeficiency virus
HUP	Hluhluwe-Umfolozi Park
ILRI	International Livestock Research Institute
IRDNC	Integrated Rural Development and Nature Conservation
IUCN	World Conservation Union (International Union for Conservation of Nature and Natural Resources)
JMB	Joint Management Board
KARI	Kenya Agricultural Research Institute
KEMRI	Kenya Medical Research Institute
KNP	Kruger National Park
KWS	Kenya Wildlife Service
LIFE	Living In a Finite Environment
LPEC	Livestock Production Efficiency Calculator
LSU	large stock unit
MAWRD	Ministry of Agriculture, Water, and Rural Development
MCF	malignant catarrhal fever
MET	Ministry of Environment and Tourism
MGE	mobile genetic elements
MOLD	Ministry of Livestock Development
NCAA	Ngorongoro Conservation Area Authority
NGO	nongovernmental organization
NIMR	Naval Institute of Medical Research (Tanzania)
NNF	Namibia Nature Foundation
NP	National Park
NSF	National Science Foundation
OAU	African Union (previously Organization of African Unity)
ODA	Overseas Development Administration
OIE	Office International des Epizooties, *also* World Organisation for Animal Health
OSS	Observatoire du Sahara et du Sahel
PACE	Pan African Programme for the Control of Epizootics
PARC	Pan African Rinderpest Campaign
PCR	polymerase chain reaction
PPR	peste des petits ruminants
RFLP	restriction fragment length polymorphism
ROSELT	Réseau d'Observatoires de Surveillance Ecologique à Long Terme
RP	rinderpest
RT-PCR	reverse transcription polymerase chain reaction
RVF	Rift Valley fever
SADC	Southern African Development Community
SANParks	South African National Parks

SARS	severe acute respiratory syndrome
SASUSG	Southern Africa Sustainable Use Specialist Group
SAT	South African Territories
SAVA	South African Veterinary Association
SEATIP	South East Africa Tourism Investment Program
SEL	South East Lowveld
SRA	serum-resistance associated (gene)
SSC	Species Survival Commission
SUA	Sokoine University of Agriculture
TANAPA	Tanzania National Parks
TAWIRI	Tanzania Wildlife Research Institute
TB	tuberculosis
TBD	tick-borne disease
TFCA	Transfrontier Conservation Area
TLU	tropical livestock unit
TPN3	Thematic Programme Network 3
TRAFFIC	Trade Records Analysis of Fauna and Flora In Commerce
TREP	Tropical Resource Ecology Programme
UAE	United Arab Emirates
UK	United Kingdom
UNCCD	United Nations Convention to Combat Desertification
UNEP-GEF	United Nations Environment Programme-Global Environment Facility
UNESCO	United Nations Educational, Scientific, and Cultural Organization
US	United States
US$	United States dollars
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
UWA	Uganda Wildlife Authority
WCS	Wildlife Conservation Society
WHO	World Health Organization
WHS	Wildlife Health Sciences
WTO	World Trade Organization
WWF	World Wide Fund for Nature (World Wildlife Fund)
ZSL	Zoological Society of London

Introduction

Looking *AHEAD* While Looking Back

Steve Osofsky, DVM, Wildlife Conservation Society, Field Veterinary Program

The "Southern and East African Experts Panel on Designing Successful Conservation and Development Interventions at the Wildlife/Livestock Interface: Implications for Wildlife, Livestock and Human Health" forum brought together nearly 80 veterinarians, ecologists, economists, wildlife managers, and other experts from Botswana, Kenya, Malawi, Mozambique, Namibia, South Africa, Tanzania, Uganda, Zambia, Zimbabwe, France, the United States, and the United Kingdom to develop ways to tackle the immense health-related conservation and development challenges at the wildlife/domestic animal/human interface facing Africa today, and tomorrow. This volume attempts to capture invitees' uniquely grounded insights, and their ideas for making the long-overdue "one health" perspective a reality in practice.

In planning this forum, one of the Wildlife Conservation Society's main objectives was to help facilitate collaborative work among a diverse array of highly skilled partners to bring sound science to bear on natural resource management decisions that directly affect the livelihoods and cultures of Africa's people, including those decisions that impact the future of Africa's protected areas and wildlife resources. Since the September 2003 forum, we have already seen strengthened as well as new partnerships, expanding circles of synergy and collaboration. The esteemed group assembled for this panel generated an impressive array of ideas for solving some of today's most critical problems at the interface between wildlife health, domestic animal health, and human health and well-being. Some of these ideas are already being implemented, meeting the Wildlife Conservation Society's hopes that this would indeed prove to be more than "just another meeting," that it would be catalytic and positive for Africa.

This forum represented the launch of the Wildlife Conservation Society's Animal Health for the Environment And Development (***AHEAD***) initiative, a program developed by WCS's Field Veterinary Program in response to the growing recognition of the critical role of animal health in both conservation and development. Throughout the world, domestic and wild animals are coming into ever-more intimate contact. Without adequate scientific knowledge and planning, the consequences can be detrimental on one or both sides of the proverbial fence. But with the right mix of expertise armed with the tools that the animal health sciences provide, conservation and development objectives have a much greater chance of being realized – particularly at the critical wildlife/livestock interface where conservation and agricultural interests meet head-on. The ***AHEAD*** initiative focuses on several themes of critical importance to the future of animal agriculture, wildlife, and, of course, people: competition over grazing and water resources, disease mitigation, local and global food security, zoonoses, and other potential sources of conflict related to the overall challenges of land-use planning and the pervasive reality of resource constraints. To date, neither nongovernmental organizations, nor aid agencies, nor academia have holistically addressed the landscape-level nexus represented by the wildlife health/domestic animal health/human health triangle.

WCS believes that "win-win" solutions to health, land-use, and broader socioeconomic challenges are attainable. ***AHEAD***, created to foster a sharing of ideas that will lead to concrete and creative initiatives addressing conservation and development challenges at the livestock/wildlife/human health interface, can help catalyze these solutions. By bringing regional expertise together to compare lessons learned, fostering communications networks that are often lacking even among practitioners in relatively close proximity, and by bringing a global perspective to problems that can benefit from the experiences of other regions, this initiative can pay dividends for protected areas as well as buffer zone communities, for core areas as well as conservancies and corridors – the places where tensions and challenges at the livestock/wildlife interface are greatest. Conflicts between livestock and natural resources must be dealt with if there is to be any hope for peaceful coexistence between the two sectors upon which so many people's livelihoods depend. The papers in this ***Proceedings*** make this quite clear.

There is probably no region on earth where animal health policies and their downstream consequences have had as tangible an effect upon the biotic landscape as in Africa, southern Africa in particular. In many parts of the world, land-use choices are often driven by government (domestic and/or foreign) incentives or subsidies that can favor unsustainable agricultural practices over more ecologically sound natural resource management schemes. Of course, livestock will remain critically important both culturally and economically in much of the region. But provided with a better understanding of disease epidemiology and grasslands ecology, land-use planners can begin to take the true costs associated with both disease control schemes and environmental degradation related to livestock management practices not well-suited to a particular ecosystem into account, and therefore more often favor a return to natural production systems. For example, in semi-arid parts of southern Africa, foot and mouth disease control programs, implemented to support beef production for an export market, may not be as profitable or as environmentally sustainable as a return to multi-use natural systems emphasizing endemic wildlife species (consumptively and non-consumptively). When it comes to animal health programs and policies in transboundary landscapes, where domestic as well as wild

animals have opportunities to cross international borders, making the right decisions becomes even more critical. Launching ***AHEAD*** with a focus on southern and East Africa, particularly with the World Parks Congress being hosted by South Africa, was indeed a very logical decision for us.

The benefits of a more holistic land-use management perspective also extend to pastoralists, people who derive the bulk of their subsistence directly from livestock – people who are often marginalized in African economies and political systems. By recognizing the ecological and economic significance of pastoralist land-use practices, conservation and development programs can lead to improved livelihoods via more strategic and efficient mechanisms for animal (and human) health care delivery, and for disease surveillance. Of course the extraordinary benefits of sound management at the wildlife/livestock/human interface reach well beyond pastoral communities. One need only look at global travails with SARS or avian influenza, foot and mouth disease, or "mad cow," to see the tremendous social and economic importance of these issues.

With rapidly expanding trade through SADC (the Southern African Development Community), COMESA (the Common Market for Eastern and Southern Africa), and ongoing globalization trends, these issues will increasingly affect the development trajectories of many African countries. Clearly, animal health issues – and their implications for human health and livelihoods – must be addressed by any regional agricultural or natural resources management strategies, including those adopted by national parks authorities, if they are to succeed.

As we look around the world, impacts from interactions between livestock and wildlife (and habitat) are often profound. The issues at this interface represent an unfortunately all-too-often neglected sector of critical importance to the long-term ecological and sociopolitical security of protected areas and grazing lands worldwide. Whether we are talking about the ongoing tuberculosis crisis in and around South Africa's Kruger National Park, or Yellowstone National Park's brucellosis saga costing U.S. authorities millions of dollars to manage, these issues merit more proactive attention than they have received to date. With its initial focus on southern and East Africa and their diverse land-use mosaics, we hope that the WCS's ***AHEAD*** initiative is poised to make a difference.

Part of the reason we convened this forum at the World Parks Congress was to help give animal health, and the health sciences in general, a seat at the conservation table. By raising the profile of the management (and research) implications of the impacts of infectious diseases on the ecosecurity of East and southern African protected areas at the World Parks Congress, we hope we have also helped sensitize the donor community to the importance of this type of work. (Please see the appendix of this volume or www.iucn.org/themes/wcpa/wpc2003/english/outputs/durban/eissues.htm for the official IUCN World Parks Congress: Emerging Issues resolution on the subject.) The fact that IUCN encouraged us to hold this forum as part of the World Parks Congress tells me we are making some headway, *pole pole,* in terms of helping the broader conservation and development communities understand the core relevance of our work and expertise to their overall objectives. As socioeconomic progress demands sustained improvements in health for people, their domestic animals, and the environment, we hope we've been successful in drawing attention to the need to move towards a "one health" perspective – an approach that was the foundation of our discussions in Durban, and a theme pervading this ***Proceedings***. We hope that conservation and development colleagues from within and, as importantly, *outside of* the health science professions will find this volume thought-provoking, insightful, practical, and applicable to their daily work.

My colleagues responsible for the contents of this exciting volume are true conservation heroes, working in the face of daunting obstacles, more often than not without adequate resources or adequate political support. I hope the "Southern and East African Experts Panel on Designing Successful Conservation and Development Interventions at the Wildlife/Livestock Interface: Implications for Wildlife, Livestock and Human Health," these ***Proceedings***, and the ***A***nimal ***H***ealth for the ***E***nvironment ***A***nd ***D***evelopment concept behind them, will continue to foster positive change for the places and people we all care so much about.

Note: The entry point to the WCS ***AHEAD*** website is at www.wcs-ahead.org. It includes the complete agenda from the World Parks Congress (Durban) ***AHEAD*** launch, abstracts of presentations, the presentation slide sets, biographical sketches and contact details for most of the invitees, as well as a range of downloadable video and audio clips from the meeting. It also includes materials on ***AHEAD*** programs that were conceived in Durban and have continued to develop since the 2003 World Parks Congress.

AGENDA

Sunday September 14th, Monday September 15th

"Southern and East African Experts Panel on Designing Successful Conservation and Development Interventions at the Wildlife/Livestock Interface: Implications for Wildlife, Livestock and Human Health"

Durban International Convention Center (ICC)-Room 3C

Associated with the "Building Broader Support for Protected Areas " Stream, World Parks Congress

PLEASE make sure you register and collect your security passes from World Parks Congress officials at the Durban Exhibition Center (DEC) before the 14th or early on the morning of the 14th so as not to miss our 9AM start.

SUNDAY September 14th

Overview of Challenges to Conservation and Development at the Livestock /Wildlife Interface :

9:00 AM Welcome/Introduction-Why Are We Here? (10 min): Steve Osofsky, Billy Karesh (WCS Field Veterinary Program and IUCN SSC Veterinary Specialist Group) and Mike Kock (IUCN SSC Southern Africa Sustainable Use Specialist Group and WCS Field Veterinary Program)

9:10 **Brief Self-Introductions, and Day 1 Guidelines** (10 min) :'Round the Room': Susie Ellis, Facilitator (CI)

9:20 **Opening Address** (20 min): Richard Kock (PACE/OAU-IBAR, and IUCN SSC Veterinary Specialist Group) "What is this Infamous 'Wildlife /Livestock Interface?'– A Review of Current Knowledge on the Subject"

9:40 Invited presentations begin (10 min each)

The State of Play

9:40 "Transfrontier Parks in Southern Africa: Animal Health Challenges" (Roy Bengis)

9:50 "Diseases of Importance at the Wildlife/Livestock Interface in Kenya" (Elizabeth Wambwa)

10:00 "Relevance of the ROSELT/OSS Programme in Maintaining the Ecological Integrity of Protected Areas and Surrounding Lands" (Jesse Njoka)

10:10 "The Influence of Veterinary Control Fences on Certain Wild Large Mammal Species in the Caprivi Strip, Namibia" (Rowan Martin)

10:20 "Wildlife, Livestock and Food Security in the South-East Lowveld of Zimbabwe" (David Cumming)

10:30–10:50 TEA BREAK #1

Perspectives on Pathogens

10:50 "Tuberculosis – What Makes it an Ideal Disease for the Interface?" (Anita Michel)

11:00 "Bovine Tuberculosis in the African Buffalo: The Role of Population Models" (Wayne Getz)

11:10 “Experiences with and the Challenges of Wildlife Health Management in National Parks of Tanzania” (Titus Mlengeya and Vitalis Lyaruu)

11:20 “Control Options for Human Sleeping Sickness in Relation to the Animal Reservoir of Disease” (Susan Welburn *et al*.)
11:30 “Rinderpest Surveillance in Uganda National Parks” (Chris Rutebarika)

11:40 “Virus Topotypes and the Role of Wildlife in Foot and Mouth Disease in Africa” (Wilna Vosloo)

11:50 “The Impact of Disease on Endangered Carnivores” (Craig Packer)

12:00 “Veterinary Challenges Regarding the Utilization of the Kafue Lechwe (*Kobus leche kafuensis*) in Zambia” (Victor Siamudaala)

12:10–12:25 QUESTIONS & ANSWERS

12:30–1:30 LUNCH (Group Facilitators and Recorders meet with Susie Ellis over lunch.)

Challenges and Opportunities-Within and Out of the Box

1:30 “The Health Paradigm and Disease Control: Consideration of the Health of Ecosystems and Impacts on Human Health and Rural Livelihoods” (Mike Kock)

1:40 “Conservancies: Integrating Wildlife Land-Use Options into the Livelihood, Development and Conservation Strategies of Namibian Communities” (Chris Weaver)

1:50 “‘Counting Sheep’: The Comparative Advantages of Wildlife and Livestock – A Community Perspective” (Michael Murphree)

2:00 “Foot and Mouth Disease Management and Land-Use Implications in the Zimbabwean Lowveld: the Rationale for Creating a Biosphere Reserve” (Raoul du Toit)

2:10 “Protected Areas, Human Livelihoods and Healthy Animals: Ideas for Improvements in Conservation and Development Interventions” (Gladys Kalema-Zikusoka)

2:20–2:35 QUESTIONS & ANSWERS

2:35 “Impacts and Value of Wildlife in Pastoral Livestock Production Systems in Kenya” (Fumi Mizutani, Elizabeth Muthiani)

2:45 “A Regional/Community Approach to Conservation and Development Interventions at the Livestock/Wildlife Interface” (George Gitau)

2:55 “Complementarity Between Community-Based Animal Health Delivery Systems and Community-Based Wildlife Management? An Analysis of Experiences Linking Animal Health to Conflict Management in Pastoralist Areas of the Horn of Africa” (Tim Leyland and Richard Grahn)

3:05 “Community-Based Animal Health Care – An Opportunity to Help Overcome the Sometimes Conflicting Interests of Rural Communities and Conservationists at the Wildlife/Livestock Interface – Challenges and Research Needs” (John Woodford)

3:15–3:30 QUESTIONS & ANSWERS

3:30-3:50 TEA BREAK #2

3:50 “Introduction of Foot and Mouth Disease-Infected Buffalo into the Save Valley Conservancy in Zimbabwe: Success or Failure?” (Chris Foggin and G. Connear)

4:00 “The Disease-Free Buffalo Breeding Project of the State Veterinary Services and South African National Parks” (Markus Hofmeyr)

4:10 “Control of Domestic Dog Diseases in Protected Area Management and the Conservation of Endangered Carnivores” (Karen Laurenson with S. Cleaveland *et al.*)

4:20 “Impacts of Wildlife Infections on Human and Livestock Health with Special Reference to Tanzania: Implications for Protected Area Management” (Sarah Cleaveland with T. Mlengeya *et al.*)

4:30 “Synergies Between Livestock Husbandry and Wildlife Conservation in Southern Province, Zambia” (Dale Lewis)

4:40–4:50 QUESTIONS & ANSWERS

4:50–5:00 WORKING GROUPS IDENTIFIED AND INSTRUCTIONS PROVIDED (Susie Ellis, Steve Osofsky)

A maximum of 5 total Working Groups are suggested as follows (names in **bold** are the suggested Working Group Facilitators; *italicized* names are the suggested Recorders). If you feel you’ve been assigned to the ‘wrong’ group or role, please let the facilitator know before the session begins:

(1) Botswana/Namibia/Zimbabwe – Guy Freeland, **Mike Kock**, Neo Mapitse, Gary Mullins, Chris Weaver, Michael Murphree, David Cumming, Raoul du Toit, Chris Foggin, Rowan Martin, *Robert Cook,* Steve Osofsky, Mark Eisler, Delphine Purves

(2) Kenya – George Gitau, Agi Kiss, **Richard Kock**, Fumi Mizutani, Elizabeth Muthiani, Jacob Mwanzia, Jesse Njoka, *Elizabeth Wambwa*, Helga Recke, Kenneth Waithiru

(3) Malawi/Mozambique/Zambia – Misheck Mulumba, *Rod de Vletter*, Simon Munthali, Bartolomeu Soto, Dale Lewis,Victor Siamudaala, Tim Leyland, **Laurel Neme**

(4) South Africa – **Roy Bengis**, Koos Coetzer, Jacques Flamand, Wayne Getz, Markus Hofmeyr, Nick Kriek, Woody Meltzer, Anita Michel, *Philip Nyhus*, Cobus Raath, Wilna Vosloo, Banie Penzhorn

(5) Tanzania/Uganda – Gladys Kalema-Zikusoka, Chris Rutebarika, Innocent Rwego, Michael Woodford, Philippe Chardonnet, Sarah Cleaveland, Robert Fyumagwa, **William Karesh**, *Karen Laurenson*, Titus Mlengeya, Pete Morkel, Craig Packer, Susan Welburn, John Woodford, Mary Phillips

5:00–? WORKING GROUPS SESSION 1.

1. Brainstorm to produce a list of priority protected areas in your Working Group's region, including those that are/could become transboundary.

2. Identify the 2–3 highest priority protected areas.

3. Define (list) the major health-related challenges/threats for each priority area.

– End of Day One Working Sessions –

Don't forget tonight's Group Dinner at the Protea Hotel Edward!

MONDAY, September 15th

New Working Groups formed as needed based on highest-priority protected areas as indicated by Day 1 outputs/ priorities.

Overview – Moderated Working Groups outline project concepts they think can practically address the health-related challenges discussed yesterday. Working Groups are to be landscape-focused so that the proposal outlines that are developed are geo-referenced to places (which include core protected areas of some type) of conservation interest (specific landscapes of focus will likely depend on representation at the meeting). The emphasis should be on projects that can and should be developed and implemented soon. Concepts emphasizing further research must justify that the proposed research is critical to improved management practices on the ground.

8:00–8:30 AM PLENARY SESSION.
Review of yesterday's outputs/priorities, new Working Group assignments and instructions (Susie Ellis and Steve Osofsky).

8:30–10:00 WORKING GROUP SESSION 2.

1. Prioritize health-related challenges for the top 1–3 priority protected areas identified within each group.
2. Begin defining 2–3 pilot projects (including transboundary endeavors) that can address the 2–3 highest priority health-related challenges for each area (*what are the most important things to do to address these challenges – why, who, what, how, when?*) Please see worksheets to be provided.

10:00–10:30 TEA BREAK #1

10:30–12:00 WORKING GROUP SESSION 3.
Continue working to flesh-out 2–3 pilot projects (including transboundary endeavors) that can address the 2–3 highest priority health-related challenges for each area (*what are the most important things to do to address these challenges?)*

12:00–1:00 LUNCH (**Working lunch** – One to two representatives from each Working Group volunteer to convene to delineate "measures of success" – what criteria should these conservation and development interventions be measured by? A suggested list of indicators of success relevant to goals at the livestock/wildlife interface should be outlined. This outline is to be distributed to all participants as the afternoon Working Groups get underway.)

1:00–2:15 WORKING GROUP SESSION 4.
Finalize 2–3 pilot projects (including transboundary endeavors) that can address the 2–3 highest priority health-related challenges for each area (*what are the most important things to do to address these challenges?)*

2:15–3:45 PLENARY:WORKING GROUP REPORTS (10 MINUTES EACH, AND 5 MINUTES QUESTIONS/ DISCUSSION PER GROUP)

3:45–4:00 TEA BREAK #2

4:00–4:45 WORKING GROUP SESSION 5.
Refine/finalize pilot projects based on feedback from plenary session. Groups should reference how identified or modified "measures of success" may help them monitor conservation/development results in their landscapes. HAND IN FINAL ELECTRONIC AND HARD COPY VERSIONS TO FACILITATOR.

4:45–5:15 GROUP DISCUSSION/REFLECTION

5:15–5:30 **Closing Address** (15 min): Billy Karesh, Richard Kock (Co-Chairs, IUCN SSC Veterinary Specialist Group) Key Themes Emerging from this Forum

5:30–5:45 **Meeting Conclusion** (15 min): Steve Osofsky (WCS) and Mike Kock (SASUSG/WCS) Thanks, and Next Steps.

– End of Meeting –

Follow-up: One product of the meeting will be proceedings of the papers presented on Day 1, and a written summary of the outlines for envisioned future work produced by Day 2's Working Groups. Longer term, WCS would like to work with interested participants from the various Working Groups to help them more fully develop the outlines into full proposals for eventual donor consideration. Obviously this will involve broader consultation within the regions of focus with a wider range of stakeholders than could be accommodated at this initial forum.

Abstracts

What is this Infamous "Wildlife/Livestock Interface?" A Review of Current Knowledge

Richard Kock

With the exponential growth of human populations in Africa over the last century, the inevitable decline in wildlife habitat and populations has been rapid. The loss has been primarily in areas of human settlement and agriculture, as here, the habitat loss is extreme. Wildlife survives increasingly in pockets of land peripheral to these areas as a result of the establishment of protected area systems (parks, reserves, and sanctuaries) or in the remaining forests, wetlands, and vast arid rangelands of Africa, which have not been settled or exploited. Africa is now a mosaic from developed landscapes to relatively unchanged habitats that recall pre-ice age communities. Probably the most stable systems over the last centuries, where the habitats have remained relatively intact, are the dry rangelands. These areas are less attractive to human settlement as the environment and climate are harsh, and agriculture is limited by low rainfall and nutrient-poor soils. Consequently, these are areas with a lower human density, and the livelihoods are often based on pastoral livestock and now, rarely, hunter-gatherer systems. Ironically, due to lack of political empowerment and cash poverty, these traditional communities are considered backwards and unproductive by urban society, whereas they should be praised for their more environmentally sustainable land-use practices, and means sought to enhance their incomes without destroying their way of life.

When considering the "wildlife/livestock interface," the understanding for this paper is that the wildlife component comprises the large mammals, which in one way or another interact with the livestock population and, more specifically, herbivores. It is here in particular that the scene is changing and novel problems are arising. This does not mean the remaining animals – carnivores, reptiles, and so on – are not important. The impact of predation and the prevalence of snakebites on livestock might be examples! These subjects are best dealt with in other fora.

A major impact of the changing landscape has been increasing competition for the finite resources, and it is here that the interface has become more apparent and contact more frequent. In summary, the wildlife/livestock interface has become more intense in certain areas, whilst it is no longer an issue in many others.

The interface can present itself in many different ways, and a better definition of the interface is needed in which it has a real impact economically or in terms of health on either the livestock or wildlife populations. This will help clarify the issues and focus research and management efforts appropriately. The subject is large, and this paper will review only the more important animal health issues at the interface:

- Diseases of importance that pass between wild and domestic animals at the physical interface with a focus on infections impacting trade in animals.
- Diseases that are transmitted through vectors between livestock and wildlife and the influence each community has on the overall prevalence and impact of the disease.
- Contact rates in relation to the competition for the resources shared between wildlife and livestock – forage and water.

See full paper on p.1.

Transfrontier Conservation Area Initiatives in Sub-Saharan Africa: Some Animal Health Challenges

Roy G. Bengis

As Africa's conservation areas come under increasing pressure from expanding human resource needs, the transfrontier conservation area (TFCA) initiatives are a welcome breath of fresh air from a biodiversity conservation point of view. In addition, the integration of land across international borders, as well as the consolidation of state and privately/communally owned land in joint ventures, may have major positive economic potential for the specific region. These initiatives are strongly supported by conservationists, ecotourism enterprises, and the public at large, because they are the first tangible moves that may reverse the current encroachment experienced by existing and established conservation and wilderness areas, as expanding local communities battle to survive the onslaughts of nature's climatic fluctuations and plagues that threaten their food security. The TFCA vision explores the possibility that changing land-use practices, from subsistence farming on marginal land to community participation in ecotourism-based enterprises, may have sustainable economic and ecological benefits for all. In the Southern African Development Community (SADC) region, there are currently seven TFCAs involving land from two or more participating countries that have already been established or are in the process and have political support with international agreements at various stages of develop-

ment and planning. A further 15 potential TFCAs have been identified by the Peace Parks Foundation in the SADC sub-region.

It is definitely not the intention of this paper to portray these environmental conservation initiatives in a negative light. The message that needs to be conveyed however, is that all parties involved should enter these initiatives with their eyes wide open, forewarned of the potential animal health implications and challenges that may be expected when increasing the currently existing geographic range of certain animal pathogens and disease vectors. Without international boundary barrier fences and with biological bridges being formed by contiguous wildlife populations, any contagious/infectious disease or vector present in any one of the participating countries or areas will predictably spread throughout the entire TFCA. Potentially problematic infections should be identified early by surveillance and monitoring, and joint containment and control measures should be established proactively when and where necessary.

These animal disease issues may also be compounded by the enlarging wildlife/livestock interface, which may negatively impact on adjoining communities. This paper deals with some of the more problematic animal infections and disease vectors that have been identified in certain TFCAs.

See full paper on p.15.

Diseases of Importance at the Wildlife/Livestock Interface in Kenya

Elizabeth Wambwa

The rangelands of Kenya occupy 74% of the country's land area and are largely inhabited by nomadic or transhumant pastoralists who comprise less than 15% of the total population. This extensive production system allows a greater interface between domestic and wild animals. This interface also occurs on large-scale private or community ranches, and with communities that border the protected areas (national parks and game reserves) around the country. With livestock and wildlife sharing the same ecosystems, several diseases can be transmitted among them. The resurgence of some livestock and wildlife diseases in Kenya that were previously controlled is of serious concern and can be attributed to several factors. The uncontrolled or illegal movements of livestock by pastoralists within the country and across national borders in search of grazing, markets, or following cattle rustling is a major factor in the spread of diseases. Seasonal wildlife movements result in constant interactions with livestock and also increase the possibility of occurrence of transboundary diseases.

The most prevalent and economically important diseases in Kenya include those caused by viruses such as rinderpest, Rift Valley fever, foot and mouth disease, African swine fever, malignant catarrhal fever, and rabies. Bacterial diseases include anthrax, brucellosis, and contagious bovine pleuropneumonia. Protozoal diseases, such as trypanosomiasis and theileriosis, and numerous ectoparasites and helminths are also prevalent. The presence of some important transboundary diseases has greatly reduced Kenya's export of wildlife, livestock, and their products to lucrative international markets. This is due to stringent requirements in sanitary standards for international trade in animals and animal products established by the Office International des Épizooties (OIE) that are a prerequisite for exporting products.

New and innovative approaches to disease control are needed, as the human/livestock/wildlife situation in Africa is highly dynamic, and current knowledge and veterinary skills should be applied at the interface. Government policy needs to focus strongly on improvement of disease control and marketing of livestock, wildlife, and their products. There is need for regional integration within East Africa to allow for free trade in animals and animal products.

This paper briefly describes the wildlife/livestock interface in Kenya with emphasis on the important diseases at this interface. It suggests measures to enhance disease control and improve trade in wildlife, livestock, and their products.

See full paper on p.21.

Relevance of the ROSELT/OSS Programme in Maintaining the Ecological Integrity of Protected Areas and Surrounding Lands

Jesse Njoka

The ecological changes taking place in protected areas are both due to natural processes and human activities. In the absence of long-term monitoring data from the protected areas, it is difficult to distinguish these two types of changes. Various initiatives to monitor these changes using modern technologies such as remote sensing devices (among others) are being tested in an uncoordinated fashion. There is a need for establishing long-term ecological observatories at the local level to monitor the ecological integrity of protected areas and the adjacent buffer zones to obtain sound scientific data on the interaction of the local human population and the natural resources, especially with respect to those within the protected areas. The goal of the Réseau d'Observatoires de Surveillance Ecologique à Long Terme (ROSELT) programme is to monitor these changes on a

long-term basis to generate scientific information for decision-making in development and for conservation of ecological integrity.

The ROSELT programme also seeks to identify management indicators at the local observatory level. Each observatory includes both the protected areas and systems altered through agriculture or urban development. The programme involves several countries participating as member countries of OSS (Observatoire du Sahara et du Sahel).

To assess how the natural system is changing with time, ROSELT seeks to establish a baseline map/state of the area under each observatory against which changes can be monitored in the future. The programme has identified several observatories that are representative of the important ecological zones in the drylands. The baseline study involves compilation of existing information from previous studies and selection of the minimum data set to be collected on a regular basis at the lowest cost. Selection of indicators, which will assist decision-makers to assess trends in the ecological integrity of protected areas as well as areas under agriculture, will be an important output of this programme. These indicators will monitor changes in the ecological, social, economic, and management trends of protected areas and surrounding areas. A well-designed monitoring and evaluation model will be able to detect threatening processes such as those related to invasive species, poaching, natural resources conflicts, and unsustainable exploitation of natural resources.

Because the pilot observatories in each participating country are certified in terms of the quality of scientific data that are collected, this certification process can be extended to protected area systems as well as to areas beyond the boundaries of protected areas. The ROSELT programme is relevant at the local level for each observatory, but several observatories at the national level will scale up the ability to detect problems that imply the need for policy change. This approach will also scale up interpretation of information at sub-regional and regional levels.

The Influence of Veterinary Control Fences on Certain Wild Large Mammal Species in the Caprivi Strip, Namibia

Rowan B. Martin

This paper is based on consultancies conducted for the Ministry of Environment and Tourism, Namibia, from October 2002 to April 2003, to develop management plans for southern savanna buffalo (*Syncerus caffer caffer*), roan antelope (*Hippotragus equinus*), sable antelope (*Hippotragus niger niger*), and tsessebe (*Damaliscus lunatus lunatus*).

Rainfall is ultimately the factor limiting the distribution and abundance of these species in southern African savannas. Prior to the great rinderpest epidemic at the turn of the 19th century, the range of buffalo extended to all parts of southern Africa that had an annual rainfall exceeding 250mm. Rainfall determines not only the final carrying capacity of the range for buffalo but also the age of first conception and fecundity of females. Roan, sable, and tsessebe do not occur naturally in areas where annual rainfall is less than 400mm, and their numbers are strongly correlated with the long-term cumulative surpluses and deficits above and below the mean annual rainfall.

The Caprivi is the only part of Namibia that enjoys an annual rainfall above 500mm, and it is to be expected that the area would carry populations of all of these species at densities of the order of 1–2/km^2. In northern Botswana in the area contiguous with the Caprivi, buffalo numbers may be as high as 100,000 and there are substantial populations of roan (1,500), sable (3,000), and tsessebe (10,000). Immediately across the international boundary, the abundance of these species decreases drastically and the populations are fragmented into isolated subpopulations.

A range of potentially limiting factors was examined to assess the primary causes of the species' poor conservation status. In the eastern Caprivi, poor land-use planning may be the primary factor limiting wild species. The ad hoc westward expansion of people and domestic livestock threatens the integrity of the range for all wild species. Wedges of human settlement are fragmenting the range and, in several places, continuity of species populations can be maintained only through spatial links with northern Botswana. Any ill- considered placement of veterinary fences in this area would likely result in the total isolation of a number of small subpopulations and, ultimately, their demise. In the western Caprivi (the Caprivi Strip), the present location of veterinary fences has caused the isolation of Mahango and Khaudum National Parks and effectively broken all linkages not only between the east and west Caprivi but also between Botswana and Namibia. At a time when there are high expectations for transfrontier conservation areas, this is a retrogressive development. Various alternative configurations and mitigating measures for veterinary fences were recently proposed in a major study commissioned by the Botswana Government but, as yet, no decisions have been reached that alter the status quo.

These conservation issues may be secondary to the long-term development potential for the Caprivi and northern Botswana based on wildlife management as the primary form of land use. The financial and economic values offered by wildlife far exceed those possible from domestic livestock.

See full paper on p.27.

Wildlife, Livestock, and Food Security in the South East Lowveld of Zimbabwe

David H.M. Cumming

The South East Lowveld (SEL) of Zimbabwe covers an area of approximately 50,000km^2 and is characterised by high temperatures, low rainfall (less than 400mm per year), and periodic severe droughts. It is also an endemic foot and mouth disease area. Apart from a high potential for irrigation in limited areas, the SEL is best suited to extensive wildlife and livestock production. Subsistence dry land cropping fails in most years because the growing season is too short and unreliable. With the advent of game ranching in the 1950s, there has been an increasing shift from cattle ranching to wildlife and tourism. The current land reform programme has adversely affected the wildlife/tourism sector and resulted in an increase in area under subsistence agropastoralism. Food security is a key issue for the region because cereal production from dry land cropping in the communal farming sector areas falls well below household requirements in most years, resulting in a high dependence on food aid.

Wildlife tourism is ecologically and economically the most suitable form of extensive land use for most of the region, and there are currently major moves to extend this through the development of transfrontier conservation areas. However, the question of food security and the role of livestock vis-à-vis wildlife in rural livelihood strategies remains unresolved and contentious. Key biophysical and resource management constraints, arising largely from conservative policies on agriculture, land use, and resource access rights, are examined, and strategies for achieving resilient and sustainable multispecies production systems are explored.

See full paper on p.41.

Tuberculosis – What Makes it an Ideal Disease for the Interface?

Anita L. Michel

In recent years, it has become evident that the role of wildlife in the epidemiology of bovine tuberculosis (BTB) has been greatly underestimated, both in developing countries as well as in the developed world. With the breakdown of traditional control programmes and a lack of an effective vaccine, it is almost impossible for affected countries to eradicate or even prevent the further spread of this chronic disease.

Compared with the effects in developed countries, where economic losses in the livestock production sector represent the most serious effect of *M. bovis* infection at the wildlife/livestock interface, the range of implications can be much broader in developing countries.

In South Africa's two largest protected areas, Kruger National Park (KNP) and Hluhluwe-Umfolozi Park (HUP), BTB has become endemic after spilling over from domestic cattle during the second half of the 20th century if not earlier. African buffalo (*Syncerus caffer*) are the main reservoir in both cases, but other species have recently shown potential to serve as maintenance hosts. Apart from the impact of this disease on the conservation of endangered species, on the genetic diversity within infected species, and with regard to international trade, tuberculosis caused by *M. bovis* poses a direct health threat to people and livestock in communities along the border of infected ecosystems. The prevalence of BTB in communal cattle is currently unknown for most of the areas, but the risk of *M. bovis* transmission from wildlife is rapidly increasing as exceedingly high herd prevalences are reached in buffalo and as the spectrum of affected wild animal species becomes broader. Against the generally proclaimed reduced susceptibility of humans to *M. bovis*, the human/livestock interface in this particular case should be considered a favourable environment for zoonotic tuberculosis because immunosuppression due to infection with HIV/AIDS can pave the way for infectious agents otherwise unable to cause disease on their own.

Along the borders of KNP and HUP, an estimated 165,000 people are living in close contact with and consume products from cattle with an unknown BTB status, but which form part of the wildlife/livestock/human triangle.

See full paper on p.47.

Bovine Tuberculosis in the African Buffalo: The Role of Population Models

Wayne M. Getz, Paul C. Cross, Anna E. Jolles, James O. Lloyd-Smith, Sadie J. Ryan, Peter W. J. Baxter, Justine Bowers, Craig T. Hay, Christiane Knechtel, Craig J. Tambling, Wendy C. Turner and J.T. du Toit

The spread of bovine tuberculosis (*Mycobacterium bovis*, BTB) in wild populations of African buffalo (*Syncerus caffer*) can be modeled at various levels of complexity, including components that *inter alia* deal with: basic and refined demographic and epidemiological processes; behavior as it relates to herd organization and the movement patterns of individuals among herds; ecological factors that focus on buffalo-vegetation, buffalo-lion, and buffalo-other grazer interactions; environmental effects, particularly the influence of rainfall and the distribution of water; BTB reservoirs in other species, as well as BTB transmission between buffalo and other species, including domestic cattle and people; and finally, the effects of various management actions in controlling BTB in natural populations. To avoid getting embroiled in details, models should be only sufficiently complex to answer the question at hand. Here we evaluate the form and utility of various modeling components in addressing different kinds of basic and applied questions regarding the spread of BTB in populations typified by herds in Kruger National Park, Hluhluwe-Umfolozi National Park, and Klaserie Private Game Reserve, all in South Africa.

Experiences and Challenges of Wildlife Health Management in the National Parks of Tanzania

Titus Mlengeya and Vitalis Lyaruu

Wildlife populations and the natural lands they inhabit are the world's foremost heritage. Tanzania is one of the countries that has abundant biological diversity and a "high megafauna" wildlife population. Wildlife species receive a high level of protection in over 28% of the country's land area in the form of national parks, game reserves, game-controlled areas, and forestry reserves. Through gradual development of tourism, wildlife is foreseen to have an important and growing economic role in poverty eradication for Tanzania. Wildlife species have been able to tolerate natural disasters, and their populations are known to rebound when the ecosystems are not disturbed. However, with increasing human population pressure and activities around protected areas, the impacts on natural ecosystems are great and the well-being of animals is compromised. Risks for disease transmission between wildlife, livestock, and people have increased significantly. Among the most challenging conditions include a giraffe ear disease, sexually transmitted disease in baboons, skin infection in giraffe, human-related diseases in chimpanzees, and other human/livestock/wildlife conflicts.

For the last seven years, Tanzania National Parks (TANAPA) has been developing a Wildlife Veterinary Unit to address the numerous emerging wildlife health challenges. However, considering the expanse of the area and the diversity of species, the ability of the Unit to address relevant issues is limited. This is because of the small number of veterinary staff, inadequate skills, insufficient funding and equipment, and low awareness of the impact of diseases on wildlife systems among decisionmakers. Because most of the emerging diseases affect large ecosystems or even cross international boundaries, there is a need to strengthen local capacity to detect and identify disease threats, launch efficient reporting mechanisms, and foster concerted efforts to manage and mitigate the impacts of disease.

See full paper on p.51.

Control Options for Human Sleeping Sickness in Relation to the Animal Reservoir of Disease

Susan C. Welburn, K. Picozzi, J. Fyfe, E. Fèvre, M. Odiit, M.C. Eisler and P.G. Coleman

To our knowledge, sleeping sickness has existed in southeast Uganda for more than 100 years, but little effort or resources have been applied to controlling the reservoir of the disease in domestic livestock or in wildlife. Control options have instead focused on controlling tsetse flies. Considering that the spot prevalence of *Trypanosoma brucei rhodesiense*, the human-infective parasite in cattle, can be up to 18% in cattle in southeast Uganda, while less than 1 in 1,000 tsetse flies are similarly infected, it would seem appropriate to target interventions towards controlling the animal reservoir of disease. A recent survey in this region has shown 100% of village cattle positive for *T. brucei* over an 18-month period of surveillance. Because this parasite appears relatively nonpathogenic to Zebu cattle, the implications of cattle-keeping for human health in this setting are serious.

See full paper on p.55.

Rinderpest Surveillance in Uganda National Parks

Chris S. Rutebarika

Rinderpest continues to pose a potential threat to both the wild and domestic ungulates in eastern Africa. In Uganda, livestock and wildlife are very closely associated. Vaccination against rinderpest in livestock ceased in 2001. Because the wildlife has never been vaccinated, serosurveillance of wildlife in this ecosystem is a very useful tool being used by the member states under PACE programmes.

In addition, passive data are collected on a regular basis by the staff of Uganda Wildlife Authority and local government veterinary services. "Suspected outbreaks" and rumours in both livestock and wildlife are investigated fully.

The rinderpest high-risk areas are located in the eastern and northeastern parts of Uganda, and the data collected from wildlife surveillance will augment data from livestock surveillance and support the implementation of the OIE pathway.

Understanding the circulation and distribution of rinderpest virus in wildlife is an essential component of rinderpest eradication and wildlife conservation programmes in Uganda.

See full paper on p.63.

Virus Topotypes and the Role of Wildlife in Foot and Mouth Disease in Africa

Wilna Vosloo, A.D.S. Bastos, M. Sahle, O. Sangare and R.M. Dwarka

The epidemiology of foot and mouth disease (FMD) on the African continent is influenced by two different patterns, viz, a cycle in which wildlife plays a role in maintaining and spreading the disease to other susceptible domestic animals and wild ungulates, and a cycle that is maintained within domestic animals. In southern Africa, the former cycle predominates due to the presence of African buffalo (*Syncerus caffer*), the only wildlife species for which long-term maintenance of FMD has been described. In East Africa, both cycles probably occur, while in West Africa, due to the absence of sufficient numbers of wildlife hosts, the disease is maintained largely in domestic animals.

Foot and mouth disease is endemic in most countries in sub-Saharan Africa, except in southern Africa, where a number of countries have been able to control FMD by separating infected buffalo and other wildlife species from livestock using fences. Vaccination is used on a limited scale in domestic animals in close proximity of the potential infectious hosts. In other parts of the sub-continent, control of FMD is surpassed by more urgent needs such as poverty and famine. However, FMD is one of the diseases that needs to be controlled if countries want to access international agricultural export markets. FMD cannot be eradicated from Africa unless all infected buffalo are removed, which is untenable from an ecological and ethical point of view.

A better understanding of the epidemiology of FMD could aid in planning control strategies. Molecular epidemiological studies have been very useful in this regard by highlighting historical and current patterns of spread across borders and by demonstrating the presence of viral topotypes that occur in both cycles of spread. Geographic clustering of virus strains into topotypes has been demonstrated for all six serotypes occurring on the continent, and genetic variation is such that topotype distribution should be considered when vaccination efforts for control of FMD are undertaken.

See full paper on p.67.

The Impact of Disease on Endangered Carnivores

Craig Packer

The potential for frequent, virulent disease outbreaks has increased as human populations have come into closer contact with wildlife. The risk to people from wildlife disease is widely recognized (e.g., Ebola, anthrax, and possibly SARS), but less attention has been paid to the risk to wildlife from domesticated animals. Wild dogs and Simien foxes have been decimated by rabies, and lions by canine distemper; both diseases originated from unvaccinated domestic dogs. Similar threats clearly endanger small isolated populations of wild carnivores that, by themselves, could never sustain deadly viruses. This presentation emphasizes the impact of multihost pathogens on long-term population trends in the Serengeti lions, and outlines the techniques we are using to measure the effectiveness of a large-scale dog vaccination program on the health of wild carnivores.

Veterinary Challenges Regarding the Utilization of the Kafue Lechwe (*Kobus leche kafuensis*) in Zambia

Victor M. Siamudaala, J.B. Muma, H.M Munang'andu and M. Mulumba

The Kafue lechwe (*Kobus leche kafuensis*), which is endemic to the Kafue Flats of Zambia, has immense ecological and socioeconomic importance. The species is important in the maintenance of the fertility of the Kafue Flats and fisheries, where fish are the major food source for aquatic birds. Economically, the lechwe is an important tourist attraction and is hunted for meat, hides, and trophies. Its ecological and socioeconomic importance is, however, progressively coming under threat from infectious diseases. A number of diseases have been isolated in the Kafue lechwe. Some of these diseases, such as brucellosis and bovine tuberculosis (BTB), pose serious conservation and public health challenges. The lechwe population has steadily declined from an estimated 80,000 in the 1970s to 41,000 in the mid-1980s. Infectious diseases, poaching, and increased grazing pressure are considered the major factors responsible for the population decline. The translocation of the lechwe to game ranches adjacent to cattle farms increases opportunities for the transmission of diseases from cattle to lechwe and from lechwe to cattle. A number of diseases, including brucellosis and BTB, have been diagnosed in lechwes on game ranches. The lechwe is now considered the sylvatic host for BTB and brucellosis, thereby complicating control of these diseases in livestock that share the same grazing pasture on the Kafue Flats. In addition, the lack of veterinary certification of wildlife products in the country places people at risk of contracting zoonotic diseases.

See full paper on p.75.

The Health Paradigm and Disease Control: Consideration of the Health of Ecosystems and Impacts on Human Health and Rural Livelihoods

Michael D. Kock

Historically, when considering disease control methods, authorities in Africa have paid scant attention to the impact these methods might have on ecosystems, the flora and fauna that reside therein, or on livelihoods in communities that might rely on these resources. Healthy ecosystems contribute to sustainable development and human well-being, and provide a diverse resource base that can be utilized on a sustainable basis to address poverty.

Ecosystems should not be viewed purely as "wildlife" or "natural community" based; rather, they should be seen to support the myriad activities of people and animals that occur on a daily basis, including livestock production. Recognition of the many ecosystems (both natural and human-derived, i.e., altered but healthy systems) that exist over a landscape and how they are interconnected is essential in developing a holistic approach to managing diseases and protecting biodiversity. Veterinarians need to move away from a "reductionist" approach to disease control and begin to recognize the value of a "one medicine, many ecosystems" approach to protecting livelihoods and addressing poverty and environmental issues.

Ecosystem health can be assessed by adopting a biomedical approach. For example, the development of ecological health or condition monitoring criteria that are linked to health monitoring of communities and their livestock would form a critical component of an ecosystem health approach. This would allow the monitoring of the overall condition of the ecosystem and its components in an "umbrella" fashion contributing towards the well-being of people, livestock, wildlife, and the environment. Monitoring should be done across landscapes, be multidisciplinary and complementary, detect (diagnose) problems, and lead to the generation of solutions (treatment).

See full paper on p.81.

Conservancies: Integrating Wildlife Land-Use Options into the Livelihood, Development and Conservation Strategies of Namibian Communities

Chris Weaver

Namibia is a large, sparsely populated southern African country. Since its independence in 1990, the Government of the Republic of Namibia has introduced an innovative conservancy formation strategy that has engaged more than 150,000 rural communal area residents in a national conservation movement. The passage of the conservancy legislation in 1996 has resulted in the registration of 29 communal conservancies, which encompass more than 74,000km^2 of wildlife habitat. Seventeen of these conservancies are immediately adjacent to state-protected areas, and cumulatively, increase the buffer and corridor areas around and between the existing protected areas by more than 42%. The groundswell of support for conservancies is being generated by an escalating flow of benefits that has doubled during three of the

past four years, reaching more than US $1.1 million in 2002. The conservancy movement has markedly changed the attitudes of communal area residents, and communities are now integrating wildlife and tourism enterprises into their livelihood strategies. As a consequence, land-use patterns across Namibia's arid and semi-arid communal areas are changing towards more environmentally appropriate and sustainable forms of game production, which concomitantly, enhances the viability of Namibia's extensive protected area network. Though conservancies are already producing significant environmental, social, and economic gains, it is believed that most of today's highly successful conservancies (e.g., the Nyae Nyae Conservancy) still have massive upside potential to increase income and benefits to their membership. However, in order to capitalize on such conservancies' growing populations of rare and valuable game, there is a need to address veterinary concerns and restrictions that severely inhibit the ability of conservancies north of Namibia's veterinary "Red Line" to market their valuable game resources.

See full paper on p.89.

"Counting Sheep": The Comparative Advantages of Wildlife and Livestock – A Community Perspective

Michael J. Murphree

Community wildlife management programmes across Africa have strived to encourage wildlife management over livestock production by small-scale rural farmers. However, despite data that indicate a higher return per km^2 and improved habitat management in areas under wildlife management systems, small-scale farmers in communal situations favour livestock over wildlife in almost all cases.

Why?

Several factors determine the comparative advantages of livestock and wildlife, including tenure, policy/legislation, and the fugitive nature of the wildlife resource. These factors have traditionally worked against wildlife as an attractive and viable land-use option by small-scale farmers in communal tenure regimes. However, wildlife has advantages of its own, such as resistance to drought and disease, cultural and traditional values, and high economic returns (in certain circumstances), as well as most often being the "meat" of preference. Where are we in this balancing act of choices? With over 20 years of community wildlife management experience in southern Africa, what are the current trends? Will community wildlife management programmes even out the advantages and disadvantages? Does southern Africa have lessons to learn from other parts of Africa? This paper will examine these issues and questions from the perspective of a small-scale communal farmer.

See full paper on p.105.

Foot and Mouth Disease Management and Land-Use Implications in the Zimbabwean Lowveld: the Rationale for Creating a Biosphere Reserve

Raoul du Toit

The Lowveld region of Zimbabwe is the semi-arid south-eastern sector of the country, in which mean annual rainfall is 300–600mm per year. This region is about 200,000km^2 and comprises 20% of Zimbabwe. It includes state land (notably the Gonarezhou National Park), Communal Lands (subsistence production), and commercial ranching areas that until recent political unrest in Zimbabwe were converting rapidly into wildlife production as the primary land-use in place of cattle ranching. These commercial ranching areas contain approximately 260 black rhinos, which constitute about half of Zimbabwe's total black rhino population. In addition, the Lowveld contains significant populations of wild dog, elephants, cheetah, white rhino, etc. The initiation of the Great Limpopo Transfrontier Conservation Area can and should lead to the inclusion of wildlife-producing areas of the Lowveld within a massive regional wildlife complex.

Although land-use patterns in the Lowveld have recently been disrupted by land invasions and by associated problems during a period of economic and political instability, the future of the area clearly lies in the comparative ecological and economic advantage that has been demonstrated in wildlife-based land-uses, regardless of who owns the land. There is an urgent need now to initiate planning and dialogue between stakeholders to maximize the wildlife potential of the Lowveld, as Zimbabwe emerges from its current instability. This may best be achieved through the initiation of a Lowveld Biosphere Programme, for which international funding and technical support must be secured. This programme would have to be strongly linked to the re-establishment of control measures for foot and mouth disease, which must become a priority for future development assistance to Zimbabwe, owing to the impacts of this disease not only on Zimbabwe's beef industry but also on the economies of adjacent countries (South Africa and Botswana).

See full paper on p.109.

Protected Areas, Human Livelihoods and Healthy Animals: Ideas for Improvements in Conservation and Development Interventions

Gladys Kalema-Zikusoka

Effective protected-area management is undermined by disease transmission at the wildlife, human, and livestock interface. The poorest people in developing countries tend to live at the borders of protected areas where the value of land is often reduced because of the threat of "problem" wildlife. Additionally, most protected areas are found in remote locations with limited access to adequate health facilities both for people and their animals, leading to a persistence of preventable diseases. Zoonotic diseases can be transmitted between wildlife, people, and domestic animals in close contact, especially if they are closely related. This can potentially have devastating consequences for public health, wildlife conservation, and ecotourism. In certain instances, all three sectors can be affected.

An ideal example is the association between people and habituated great apes. In Uganda, scabies skin disease outbreaks in a tourist group of mountain gorillas (*Gorilla gorilla beringei*) resulted in morbidity and mortality. These outbreaks are thought to have been associated with the relatively high incidence of scabies in the local community. Further scabies outbreaks in another habituated group of mountain gorillas is one of the factors delaying the start of tourism to this group. Ecotourism provides employment for surrounding communities and revenue that is shared for community development. Not only are people's livelihoods improved, but so is their attitude towards wildlife conservation. This particular case is one in which disease prevention measures in wildlife can be effective only if public health is improved. Tuberculosis and brucellosis are zoonotic diseases that can be transmitted between cattle and people. Around protected areas, cattle frequently mix with closely related wildlife, such as buffalo *(Syncerus caffer)*, providing an opportunity for disease transmission. This case is one in which preventing disease in people can be done effectively only by controlling disease in cattle and wildlife. In both these cases, health education to improve hygiene including boiling milk (tuberculosis and brucellosis) and washing clothes (scabies) is necessary.

An integrated approach could be more cost effective in preventing and controlling diseases around protected areas. This could be limited to close collaboration such as sharing knowledge and health information between medical, veterinary, and wildlife departments, or could be fully integrated by combining health programs for wildlife, people, and their domestic animals. Although most protected areas are in remote locations, some protected areas have relatively good infrastructure for wildlife conservation and ecotourism activities. People in the wildlife and tourism community can improve the situation by extending their resources to improve health service delivery for people and their domestic animals, such as transportation of medication to people in remote areas. To achieve a great impact, multidisciplinary teams from wildlife, medical, veterinary, and information and communications technology sectors should be created to combine expertise in education and health programmes. Mutual training programs in wildlife, domestic animal, and human health monitoring, as well as sharing of laboratory facilities for disease diagnosis, could help to maximize the use of limited resources while building local capacity and being more sustainable. Research on interrelated conservation and public health issues should be encouraged and results shared with policymakers. Finally, funds from health donors could be given to wildlife conservation where it directly affects public health and, similarly, funds from conservation donors could be given to public health when it directly affects wildlife conservation. Close collaboration between governments, NGOs, the private sector, universities, and schools would be needed to develop efficient and effective programs.

See full paper on p.113.

Impact and Value of Wildlife in Pastoral Livestock Production Systems in Kenya

Fumi Mizutani and Elizabeth Muthiani

Four Kenyan pastoral communities in semi-arid areas of Laikipia and Amboseli participated in an in-depth socio-economic household survey corresponding to 1-year periods within the March 2001 to March 2003 time frame. One hundred households were selected randomly from the geographic clusters within each community to compare characteristics of different communities. The year surveyed was considered, by the communities, an average/good year for Laikipia and a bad year for Amboseli.

Laikipia communities had fewer cattle than the Amboseli community and derived less net profit proportionately. However, the wildlife-based enterprise benefited every level of the community in poorer pastoral communities – more than in wealthier ones – compared with the benefits derived from livestock production.

Reductions in communities' livestock production caused by predation and major diseases have been calculated using the Livestock Production Efficiency Calculator. This paper includes an examination of variables such as group ranch size, rainfall, soil fertility, and progress in community-based wildlife utilisation.

See full paper on p.121.

A Regional/Community Approach to Conservation and Development Interventions at the Livestock/Wildlife Interface

George Gitau

Conflicts between people, livestock, wildlife, and the environment have remained a sensitive issue in many parts of Africa, especially in East Africa. These conflicts arise from the use of shared natural resources that have been increasingly dwindling during the last few years. The latter is associated with an increasing human population, changes in land-tenure systems, and land use moving increasingly towards agro-pastoralism and sedentarisation of formally migratory groups of pastoralists. In addition, there has been an increased uncontrolled encroachment of national parks and private ranches by the pastoralists in search of grazing resources.

The United Nations Convention to Combat Desertification (UNCCD) selected the African Union/Interafrican Bureau for Animal Resources (AU/IBAR) as one of its focal points. The UNCCD mandated AU/IBAR to address the Thematic Programme Network 3 (TPN3) that focuses on the theme area of "rational use of rangelands and fodder conservation." To address the above theme, AU/IBAR has initiated a cluster of stakeholder meetings in 2002 comprising local, regional and international institutions with interest or currently working at the livestock/wildlife/environment interface. After a series of meetings between AU/IBAR and the partners, existing gaps were identified in the understanding of the socioeconomic, political, and institutional drivers for environmental change and degradation at the interface between the livestock within pastoral systems and wildlife and the environment. A proposal has been developed for funding and is currently receiving positive consideration by UNEP-GEF.

The main objectives of the project proposal are 1) to develop models and approaches to stabilize livestock/wildlife populations for sustainable livelihoods, biodiversity conservation, and reduced land degradation; and 2) to enhance capacity for management at the livestock/wildlife interface for economics and/or food security in Africa. This will be achieved through community and regional approaches via compilation of a database from available information from other studies and from pilot activities set up by the project, and by enhancement of capacity for dissemination of the livestock/wildlife/environment interface model through the TPN3 in Africa.

Complementarity Between Community-Based Animal Health Delivery Systems and Community-Based Wildlife Management? An Analysis of Experiences Linking Animal Health to Conflict Management in Pastoralist Areas of the Horn of Africa

Tim Leyland and Richard Grahn

Community-based animal health delivery systems have been developing since the early 1980s across all continents. They are now accepted as viable mechanisms for bringing services to remote, marginalised, and under-served livestock-keeping communities. In recent years, there has been a concerted drive in the pastoralist areas of the Horn of Africa to make these systems sustainable through privatisation, supported by enabling policies and legislation. This process has forced advocates for these delivery systems to confront core non-animal health problems, such as access to markets, political marginalisation of pastoralist communities, and conflict. This paper briefly describes how successful community-based animal health delivery systems function. It gives examples of the positive impact these projects have had on the livelihoods of livestock owners. They have also proved vital in gaining the confidence of pastoralists and assisting the pastoralists themselves to manage local conflicts such as livestock raiding. The authors note that whilst much progress has been made at the community level in conflict management, sustainable peace and improved economic outcomes require policy and legislative change by responsible governments, based on a fuller understanding of pastoralist problems. This understanding will have to come from pastoralist communities themselves through their attainment of a voice and ability to advocate for improvements.

During the course of animal health-linked conflict management work in pastoralist areas, the weak management of wildlife resources has emerged as a community concern. Opinion leaders in pastoralist communities are advocating increased efforts from communities and other stakeholders to address the massive wildlife depletion that has taken place in pastoralist areas of the Horn of Africa over the past 30 years, primarily through game meat off-take. Some of the local leaders' suggestions are presented. The authors note that pastoralists are more likely to address issues of wildlife and habitat destruction once their more crucial livelihood problems (particularly animal health and conflict) are being solved.

Given the geographic closeness of wildlife and pastoralist grazing lands in the Horn of Africa, the paper examines community involvement in wildlife conservation and management around protected areas. It asks whether some of the lessons learned from community animal health programmes and their links with conflict prevention could be utilised to

improve wildlife conservation and management in pastoralist communities. The authors conclude that there is an opportunity to add value to community-based wildlife management schemes by linking them with community-based animal health initiatives. Such linkages require more dialogue and collaboration between conservationists, veterinary practitioners, and pastoralists.

See full paper on p.133.

Introduction of Foot and Mouth Disease-Infected Buffalo into the Save Valley Conservancy in Zimbabwe: Success or Failure?

Chris Foggin and G. Connear

A total of 618 buffalo *(Syncerus caffer),* known to be carrying foot and mouth disease (FMD) and originating from the west and southern regions of Zimbabwe, were released into the Save Valley Conservancy in the southeast region of Zimbabwe between 1995 and 2002. This Conservancy consists of 24 different title deeds with multiple ownership. It is 3,420km^2 in area and is stocked with numerous other species of wildlife. On veterinary instructions to facilitate the buffalo release, all livestock was removed, and an electrified, double fence was constructed around the 312km perimeter of the Conservancy (the inner fence was 1.2m high with six strands, and the outer fence 1.8m high with 12 to 14 strands). Despite careful fence maintenance, an outbreak of FMD occurred in cattle adjacent to the Conservancy within two years of the initial release. Subsequent to that, a further four outbreaks of the disease have occurred within 10km of the outside of the perimeter fence, although not all of them appear to have originated within the Conservancy. Ongoing serosurveys of wildlife indicate that FMD virus circulates widely in eight species of antelope, and especially greater kudu (*Tragelaphus strepsiceros*), which have shown 34% seroprevalence. Since the year 2000, the continuing land crisis in Zimbabwe has further facilitated spread of this disease with some 22% of the Conservancy being occupied against the owners' wishes, resulting in the destruction of 80km of the perimeter fence. There are presently over 5,000 cattle within the Conservancy, and many wildlife animals have been illegally killed. It is concluded that, to date, this buffalo introduction has had more failures than successes.

The Disease-Free Buffalo Breeding Project of the State Veterinary Services and South African National Parks

Markus Hofmeyr

The African buffalo *(Syncerus caffer)* is one of the more important wildlife species, ecologically and economically, in Africa. It occurred historically in large herds throughout South Africa, and played an important ecological role as a bulk grazer. Extensive over-hunting, the rinderpest epidemic of the late 19th century and, lately, its role as a carrier of economically important diseases have restricted the range and resurgence of this species back into its former habitat in South Africa.

The Department of Agriculture's Veterinary Services in Kruger National Park has done extensive studies on the dynamics and epidemiology of the economically important diseases carried by buffalo such as foot and mouth disease, corridor disease (theileriosis), bovine tuberculosis, and brucellosis. This research has allowed the innovative "disease-free" buffalo-breeding project to be initiated by the veterinary staff of South African National Parks (SANParks) in Kruger National Park. The driving force for this project is SANParks' need to reintroduce buffalo into newly established national parks within its former range.

This presentation describes how, through collaboration between the State Veterinary Services and SANParks, a breeding project has been developed that rids buffalo of the economically important diseases (foot and mouth disease, corridor disease, bovine tuberculosis, and bovine brucellosis) so that reintroduction into former range can be undertaken without risk to neighbouring farming communities.

Control of Domestic Dog Diseases in Protected Area Management and the Conservation of Endangered Carnivores

Karen Laurenson, Titus Mlengeya, Fekadu Shiferaw and Sarah Cleaveland

Disease is an increasing threat to many of the world's endangered carnivores, from those in North America to those in Africa. To date, rabies and canine distemper have given the greatest concern, causing severe declines in and local extirpations of a range of species, including the black-footed ferret, Channel Island foxes, Ethiopian wolves, African wild dogs, and lions. In many of these examples, particularly in Africa, outbreaks in wildlife have occurred when pathogens have spilled over from a surrounding reservoir of domestic dogs. With dog populations and thus risk of spillover constantly increasing, many protected area managers are taking measures to reduce this disease risk to endangered carnivores. The range of approaches available includes reducing disease in target species, reducing disease incidence in the reservoir dog population, and preventing contact between the target and reservoir species. Reducing disease risk in endangered carnivores can be effected by directly vaccinating or treating endangered individuals. This approach has been tried for black-footed ferrets, African wild dogs, and Channel Island foxes, but has been limited by logistical and technical constraints such as the availability of safe and efficacious vaccines. Reducing disease incidence in reservoir dogs has been tried by directly vaccinating or treating or indirectly through reducing the size of the dog population by culling or limiting reproduction. Dog vaccination has been carried out around several protected areas in Tanzania such as the Serengeti National Park (NP), Ruaha NP, and Udzungwa NP, and in Ethiopia, particularly the Bale Mountains NP, to protect the Ethiopian wolf. If done with sufficient scale and commitment, this approach has been effective. Culling and limiting the size of dog populations face considerable cultural challenges. Education campaigns to encourage responsible dog ownership have been conducted in Ethiopia, although with limited effect. Future work to reduce the need for dogs in Ethiopia is planned. Contact could be reduced through fencing or other physical barriers, restraining dogs, or through reducing human and thus dog movements in wildlife habitat. Fences are common in protected areas in South Africa but have not always prevented rabies outbreaks, particularly when small carnivores may be a vector from reservoir dogs or a component of the reservoir themselves. Encouraging owners to tie dogs has had limited success in Ethiopia. Overall, wildlife managers are ill-equipped to reduce disease threats to endangered carnivores. Conducting successful campaigns will require currently available approaches to be tailored to the specifics of the situation.

See full paper on p.141.

Impacts of Wildlife Infections on Human and Livestock Health with Special Reference to Tanzania: Implications for Protected Area Management

Sarah Cleaveland, Karen Laurenson and Titus Mlengeya

Microbial pathogens are integral components of natural ecosystems and play an important role in the evolution and ecology of host communities. However, the growth of the human population and expansion of associated activities have affected contact and transmission patterns between human and animal populations, leading to the emergence of several major diseases that affect human health, livestock economies, and wildlife conservation.

Zoonotic pathogens, particularly those that infect wildlife, pose a particular risk for human disease emergence (relative risk for zoonoses = 1.97; for pathogens infecting wildlife = 2.44). Zoonotic diseases associated with wildlife, such as sleeping sickness and anthrax, also pose a potential threat to the tourist sector, which is a major source of foreign exchange in many African countries. Wild animal populations are often implicated as reservoirs of emerging zoonoses, but we have little knowledge of the infection dynamics of these diseases in wildlife, which limits the options and effectiveness of disease control.

Infections in wildlife also have major implications for livestock development in areas adjacent to wildlife (protected) areas. Most livestock pathogens (54%) can also co-infect wildlife. Where wildlife populations are the source of disease for livestock, land-use conflicts invariably arise, typified by problems associated with malignant catarrhal fever in East Africa and foot and mouth disease in southern Africa. Malignant catarrhal fever has been a major factor contributing to the decline in livestock production in pastoralist communities living in and around protected areas of East Africa, leading to a growing demand for cultivation, a form of land use generally incompatible with wildlife conservation. In other resource-poor communities, a deteriorating livestock production base, exacerbated by diseases transmitted from wildlife, has also fuelled a growth in illegal wildlife hunting to meet growing demands for both dietary protein and cash income.

Options to control infection in wildlife are limited, and current strategies, such as culling and movement restriction, have major negative repercussions on wild populations. Engaging wildlife managers in issues relating to both public health and livestock development is therefore crucial in order to develop effective and appropriate strategies for disease control.

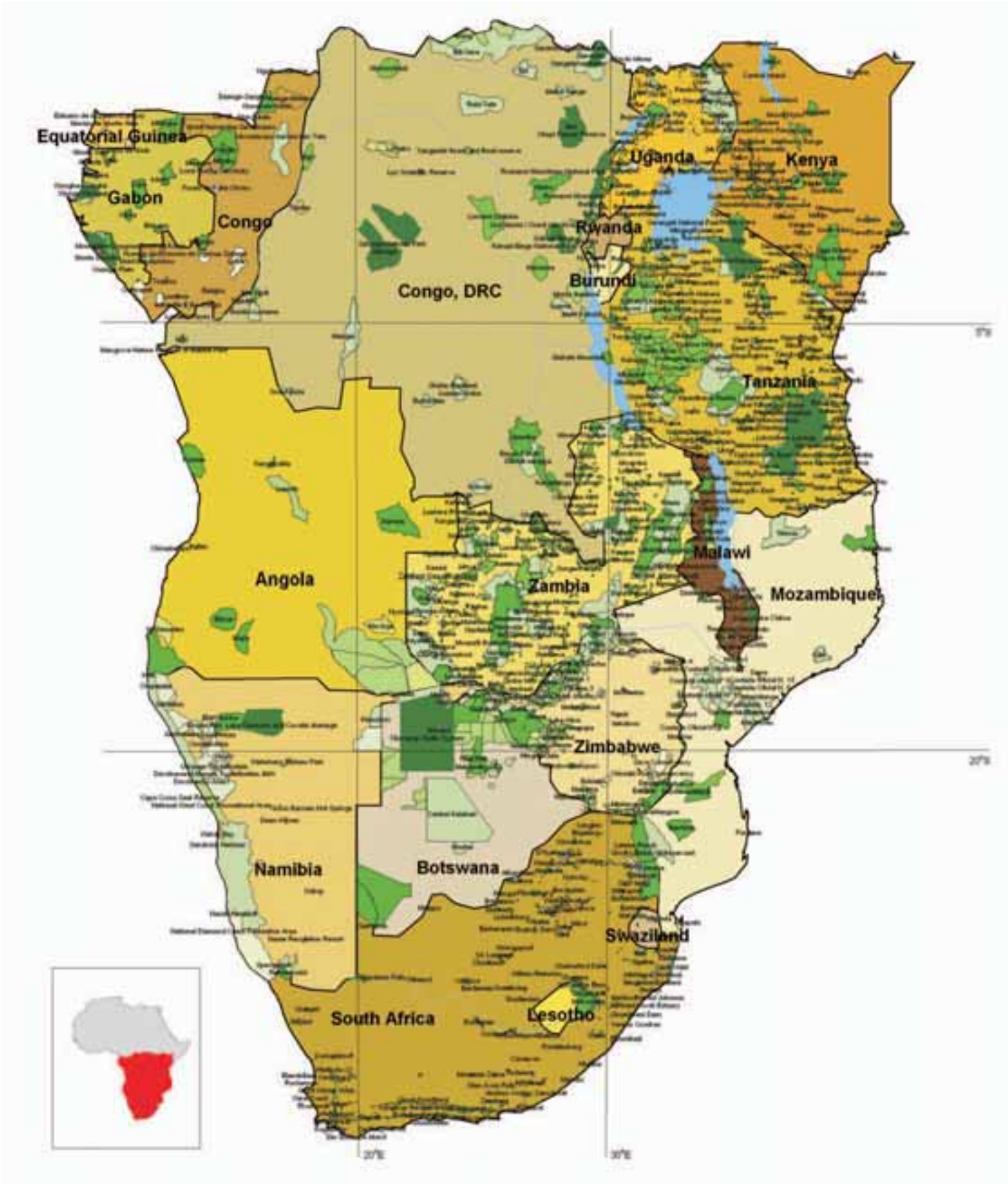
See full paper on p.147.

Synergies between Livestock Husbandry and Wildlife Conservation in Southern Province, Zambia

Dale Lewis

Wildlife conservation solutions in rural areas surrounding protected areas are often hidden in a complex web of livelihood constraints and needs that increase the risks for wildlife/human conflicts. Most wildlife managers are not trained to look for such relationships, and rural development specialists generally do not adapt their rural livelihood solutions to conservation. This paper illustrates the critical importance of building conservation programmes around such relationships for wildlife areas where the potential for human/wildlife conflict exists. Such conflicts are especially exacerbated when human populations suffer hardships of food shortages and low income. Two real-life examples in Zambia are described in which disease of domestic species (cattle and poultry) plays an important role in influencing poaching rates. Pilot studies show how appropriate interventions that enhance the synergy between wildlife conservation and human livelihoods through applied animal husbandry can lead to relatively low cost solutions to wildlife conservation challenges.

See full paper on p.153.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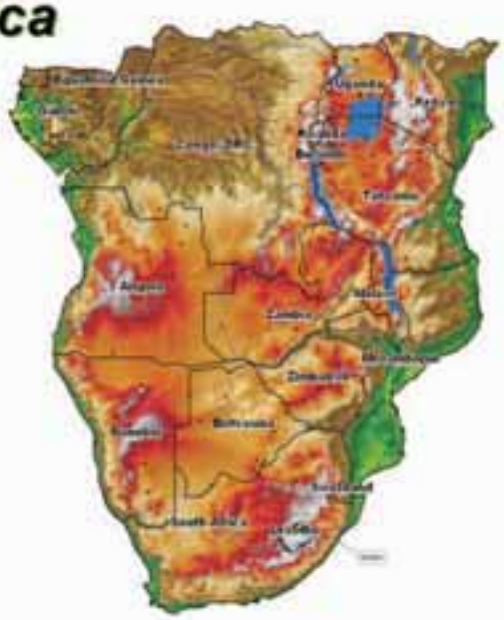
Botswana
Swaziland
South Africa
Lesotho

National Parks and Other Major Conservation Areas of East and Southern Africa



Topography

- Country Boundaries
- Major Cities
- Major Rivers
- Major Lakes

Altitude (m)

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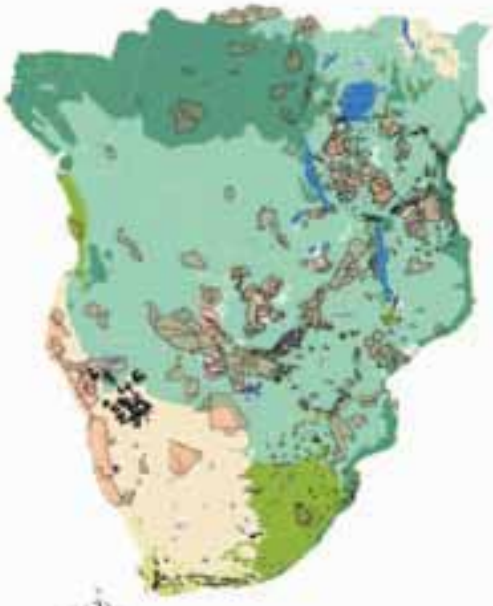

Protected Areas

- International Protected Areas
- National Parks, Reserves
- State Forests, Reserves
- Forest Reserves
- Nature, Wilderness, Wildlife Reserves and Management Areas
- Conservation Areas, Conservancies
- Genetic Parks, Reserves, and Protected Areas
- Other Forests, Reserves and Sanctuaries
- Recreation Parks, Areas
- Games, Safari, Hunting, and Private Reserves
- Marine and Wetland Reserves, Parks and Sanctuaries
- Not Protected, Production Forest, Unknown
- Major Lakes
- Major Rivers

Ecoregions

- Country Boundaries
- Deserts and xeric shrublands
- Flooded grasslands
- Mangroves
- Mediterranean scrub
- Montane grasslands
- Tropical and subtropical dry broadleaf forests
- Tropical and subtropical grasslands
- Tropical and subtropical moist broadleaf forests
- Water
- Protected Areas

Created by Sara Zeigler and Philip Nyhus, Franklin and Marshall College
July 2003

Protected area data provided by United Nations Environment Programme - World Conservation Monitoring Centre (UNEP-WCMC)
WDPA, May 2003
Country boundary, river, lake, and city data from ESRI
GTOPO30 topographical data from United States Geologic Survey (USGS)

Projection: Africa Albers Equal Area Conic
Central Meridian 25.0
Standard Parallel 1: 20.0
Standard Parallel 2: -23.0
GCS WGS 1984

Errors related to any political or conservation boundaries or any omissions of sites remain those of the authors and do not reflect the official opinions of Franklin and Marshall College or any other organization involved in the AHEAD forum.

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