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Overview: Reports from US - African BioMathematics Initiative: Conservation Biology

How do you combine the expertise of graduate students trained as mathematicians and conservation biologists, from two continents, to explore important questions in African conservation biology? This question was at the heart of the formation of the US-African BioMathematics Initiative: Conservation Biology, a jointly funded enterprise of the Center for Discrete Mathematics and Theoretical Computer Science (DIMACS), the Mathematical Biosciences Institute at Ohio State University (MBI), the Society of Mathematical Biology (SMB), the London Mathematical Society (LMS), and the US National Science Foundation (NSF). Two advanced studies institutes, or ASIs, with guest lecturers, a follow-up workshop and fieldtrips to see, first-hand, the local conservation needs in question, were held in South Africa (2010) and Kenya (2011).

Researchers working in the fields of mathematical modeling and conservation biology provided a series of lectures in population viability analysis, global climate change, harvesting, disease modeling, conservation genetics, remote sensing, reserve design, agent-based modeling and practical concerns in real-world conservation and management. These lectures established a common background among the students, while examining the range of fields pertinent to research into questions in mathematical modeling in conservation biology. These lectures were augmented with computational exercises, in multiple software platforms, giving students hands-on experience and coded examples to build on. Students from the US and ten African countries from the fields of mathematics, ecology, conservation biology, and wildlife and natural resource management came together for an intense week of training, reinforced and implemented in group projects.

Projects were formulated, conceived and chosen by the students, with guidance from the mentors. They included: agent-based modeling of anti-poaching strategies amongst villages with human-elephant conflict, modifying epidemiological models of bovine tuberculosis in African buffalo to understand directed culling efforts in the face of different transmission scenarios, modeling population viability and management of impacts on the flamingoes in Lake Nakuru, spatial modeling of landscape fragmentation and elephant movement corridors in Kenya, to name a few. Projects were initiated at the institutes, and plans for continuing work, through email and other means of communications were formalized and approved by faculty mentors.

This mini-symposium is a product of the initiative that was not part of the original prospectus for funding. The initiative funded a follow-up institute to the originally planned single combined institute and workshop. Faculty who would otherwise not have met each other have been inspired to collaboratively apply for funding to continue teaching these institutes, and to conduct joint research in the future. A minimum of three publications and 5 talks are resulting from student projects formed at these institutes, so far, and established connections to the South

African Wildlife College (SAWC) and Kenya Wildlife Services Training Institute (KWSTI) at Naivasha are spawning new ideas and project bases.