



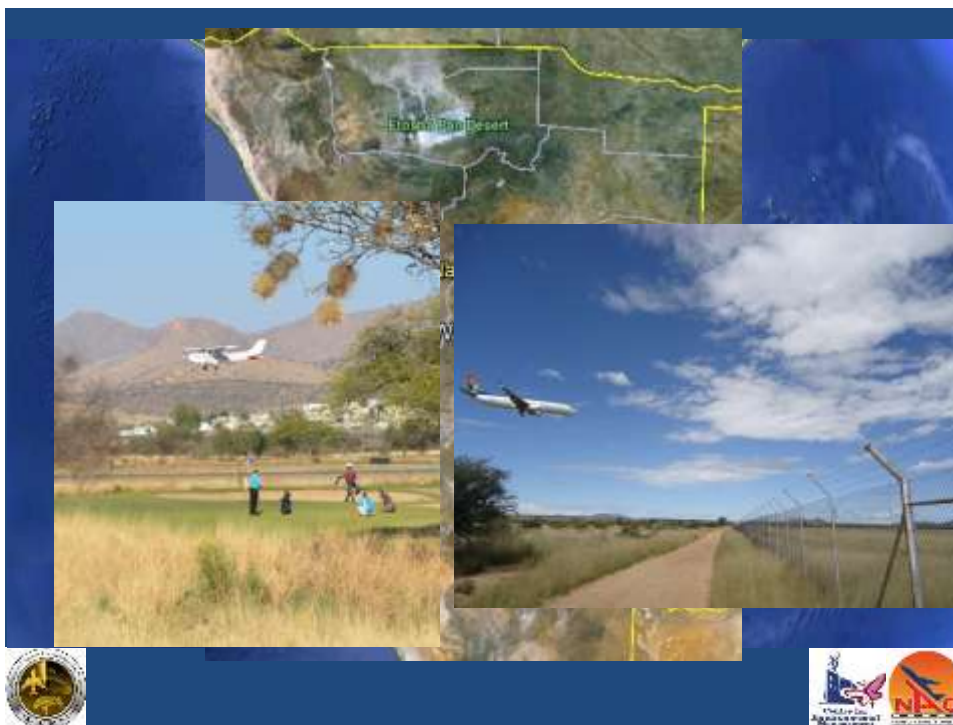
Ecosystem factors and their effect on aircraft-wildlife collisions in Namibia

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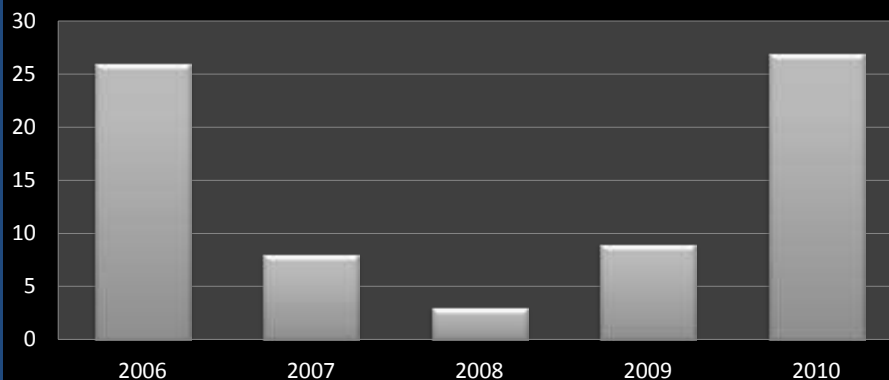
Study sites

Hosea Kutako International Airport	Eros Aerodrome
Rural setting	Urban setting
Predominantly jet-turbine aircraft	Predominantly propeller engined aircraft
Low aircraft traffic volume	High aircraft traffic volume
Game and cattle ranching and as dominant surrounding land-use	Urban and recreational (golf) surrounding land-use

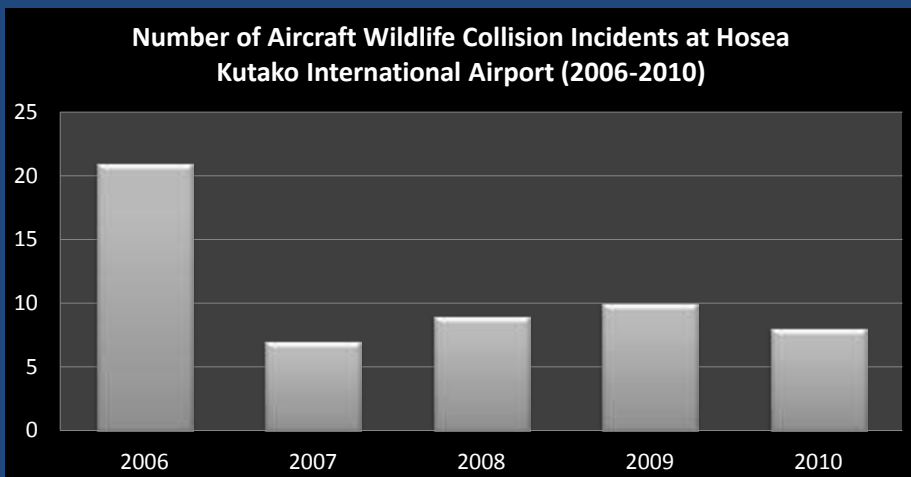


Setting the scene

Number of Aircraft Wildlife Collision Incidents at Eros Airport (2006-2010)



Setting the scene



Setting the scene

- Average “collision” rate:
 - Eros 11 (per 10 000)
 - Hosea Kutako 4.6 (per 10 000)
- Three serious incidents in Namibia in the last 5 years
 - R 27 Million
 - R 1 M
 - Undetermined (737 turbine engine severely damaged)



Airports as Ecosystems (not a new concept)

- Ecosystem services provided by airports include:
 - Food (airline food waste, gardens, grazing)
 - nesting sites & roosts (hangars, windsocks, antennae, radar beacons)
 - safety from predators (fenced off)



Ecosystem factors taken into account

- Grass height (mowed vs unmowed)
- Airport property to surrounding land use
- Woody structure
- Urban vs rural airport surrounds
- Summer vs winter small-mammal and insect abundance and diversity



Small mammals

- Small-mammal surveys
 - 9 transects of 100 traps (5m apart)
 - 4 x 24 hour trapping period (recording 2 x daily)
 - Repeated for summer and winter

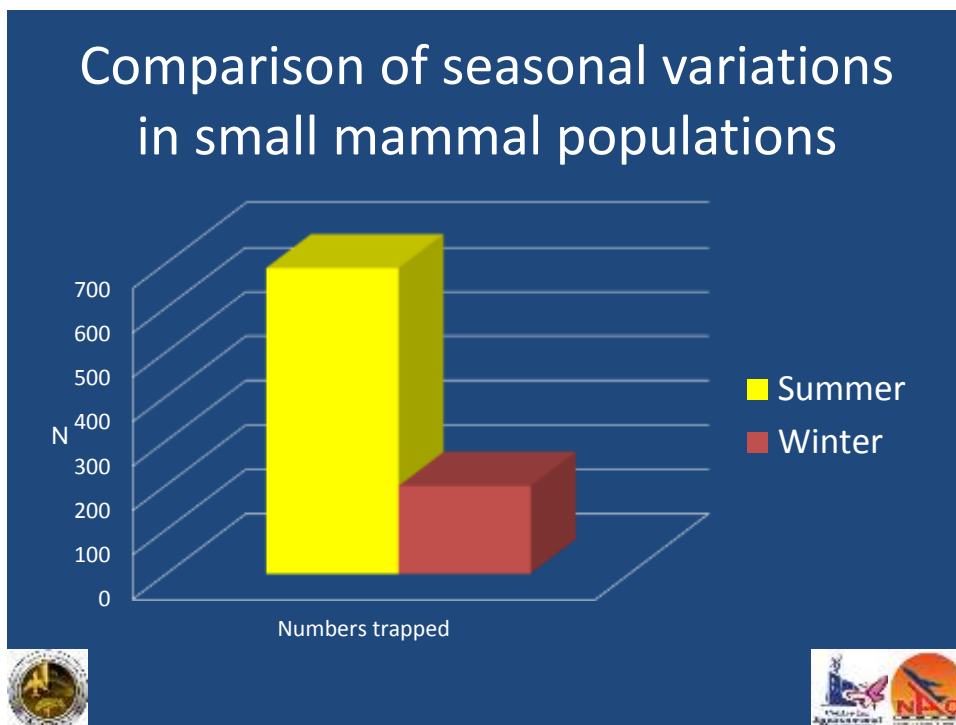
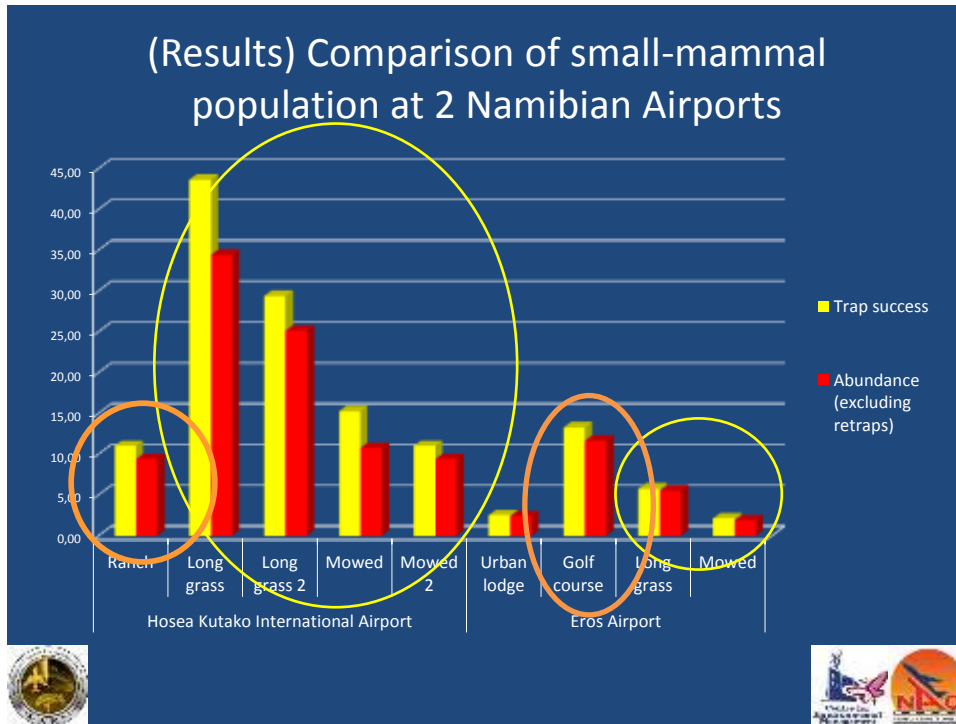


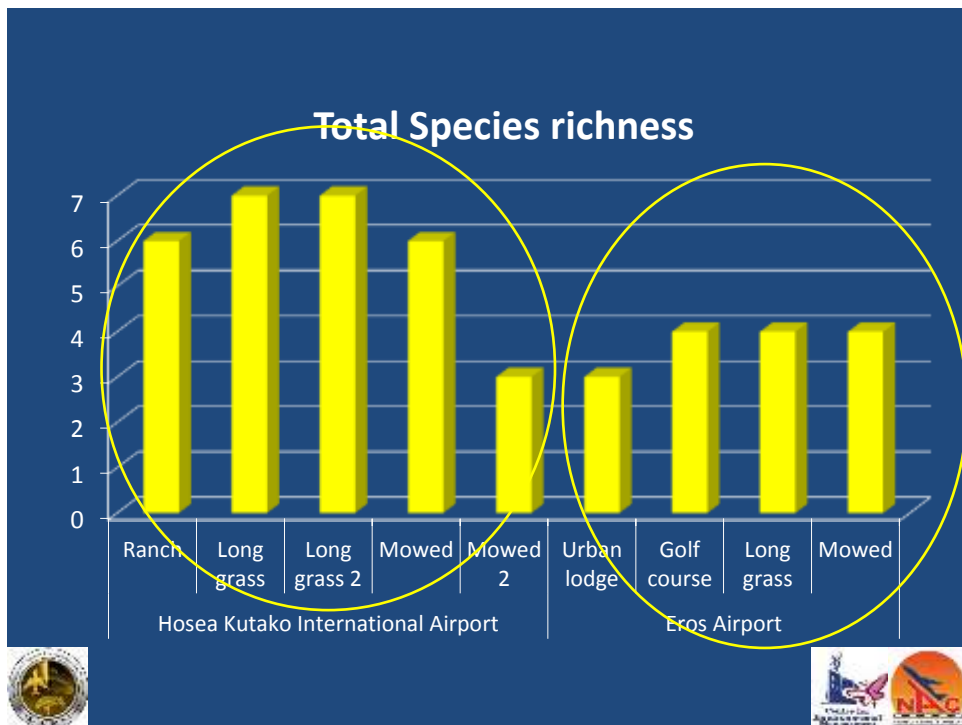
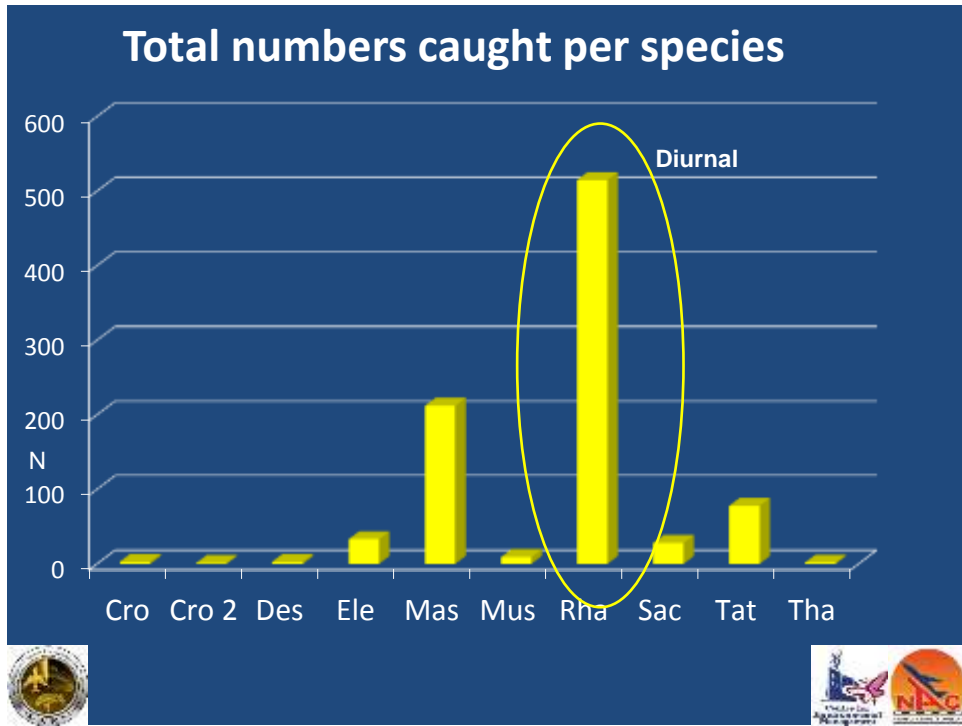
Results

Airport	Transect	Trap success	Abundance (excluding retraps)	Species richness	Shannon diversity (log)	Simpson diversity (1/D)	Evenness
Hosea Kutako International Airport	Game Ranch	11.00	9.38	6	2.14	0.25	0.42
	Undisturbed	43.63	34.38	7	1.46	0.53	0.20
	Undisturbed 2	29.38	25.13	7	1.50	0.45	0.18
	Short grass	15.25	10.75	6	1.36	0.52	0.26
Eros Airport	Short grass 2	11.00	9.38	3	1.47	0.38	0.52
	Urban lodge	2.50	2.38	3	1.12	0.53	0.61
	Golf course	13.25	11.63	4	1.46	0.42	0.47
	Long grass	5.75	5.50	4	1.47	0.39	0.37
	Short grass	2.13	1.88	4	1.24	0.53	0.51







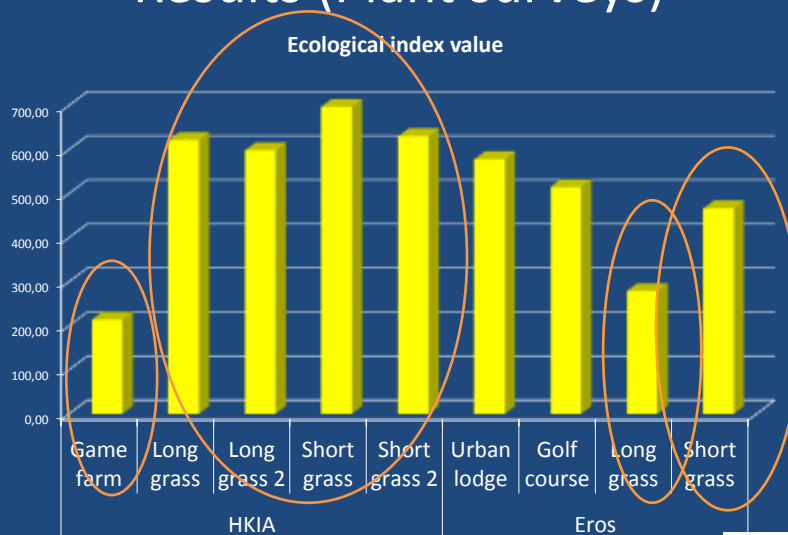


Plant surveys

- Ecological Index (rangeland condition) comparisons of same surveys as used for small mammals
- Method weights grass species according to their ecological status in the rangeland

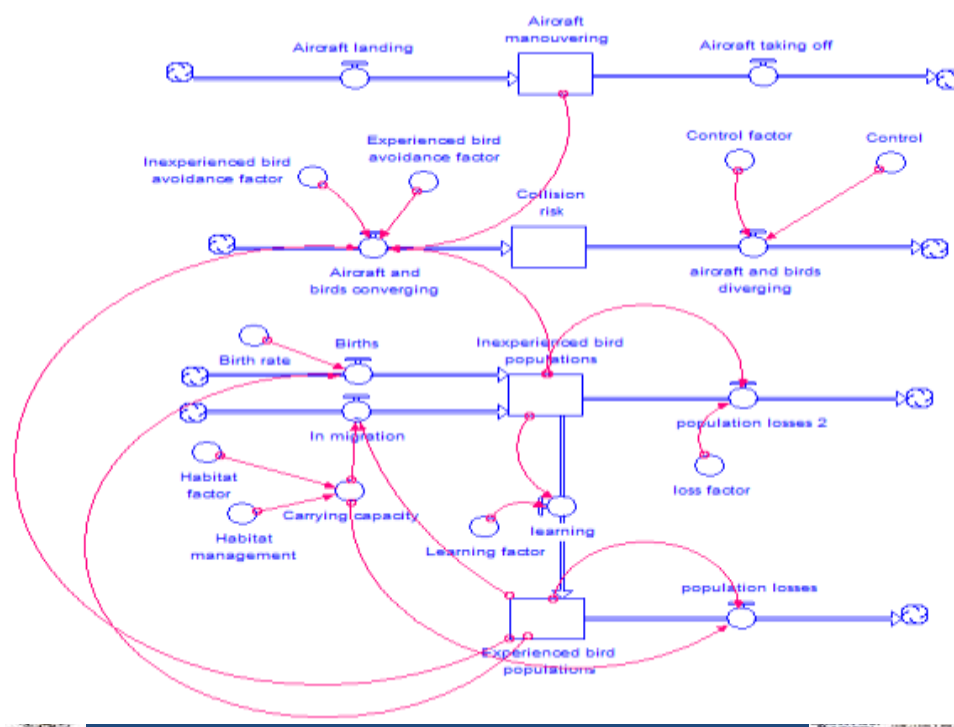


Results (Plant surveys)



The usefulness of system modelling

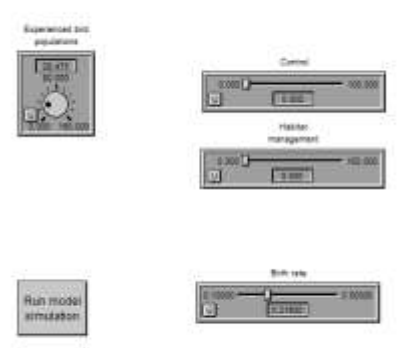
- BAM's used extensively
- GIS modelling helps identify collision "hotspots"
- Systems modelling considers a number of factors influencing the frequency of collisions
- Predicts changes in risk over time



The Bird-strike Systems Model

Control interface

Experienced bird populations



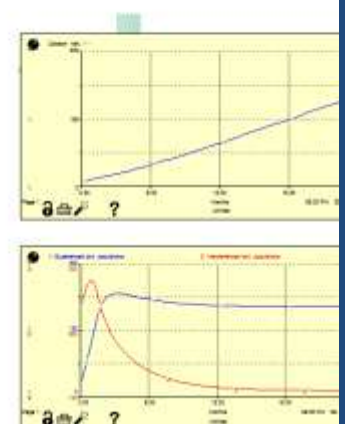
Control: 0.000 to 100.000

Habitat management: 0.000 to 100.000

Bird rate: 0.0000 to 0.0000


Run model simulation

Systems model of aircraft wildlife collisions



Graph 1: Shows a linear increase in collisions over time (0 to 1000).

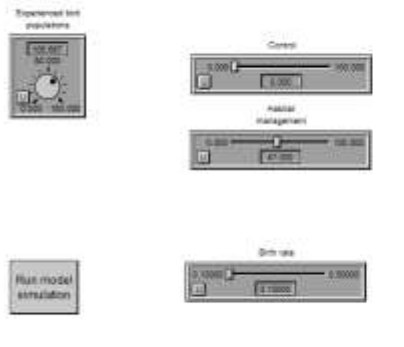
Graph 2: Shows a peak in collisions followed by a decline and stabilization (0 to 1000).



Simulation

Control interface

Experienced bird populations



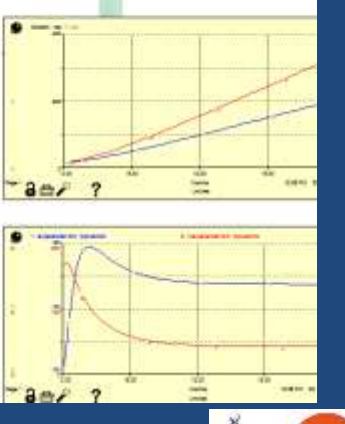
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Run model simulation

Systems model of aircraft wildlife collisions



Graph 1: Shows a linear increase in collisions over time (0 to 1000).

Graph 2: Shows a peak in collisions followed by a decline and stabilization (0 to 1000).



Conclusions

- Mowing grass lowers the number of small mammals occurring at Hosea Kutako airport (significant)
- Mowing and non-grazing increases the rangeland productivity of the airport
- Mowing some areas (once a year) and others not has antagonistic effect



Conclusions cont....

- The airports are a sanctuary for biodiversity – protecting small mammals, plants and insects against predation
- Neighbouring land use influences the abundance of small mammals around airports



So what?

- Likely correlation with raptor numbers (predators) which are risk species at airports, can help determine risk;
- Indicates effectiveness of mowing of grass at airports as a control measure for aircraft-wildlife collisions (International literature is inconclusive);
- Small mammals can be an effective monitoring indicator for ecosystem changes at airports – early warning system



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