

A Vegetation Based Index of Biotic Integrity applied to Riparian Vegetation in East Africa

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14th meeting of the German Working Group on Vegetation
Databases



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Outline

- Introduction
 - East African Wetlands
 - Globe Wetlands Project
- Development of a Vegetation Based Index of Biotic Integrity
- Link to vegetation databases
- Conclusion



“Reconciling future food production with environmental protection”

- Food production / yields in East African stagnating or declining
- Increasing demand for crop land
- Wetlands offer great potential for food production



GlobE-Wetlands - Introduction

- (Unsustainable) use may negatively effects biodiversity and important ecosystem services

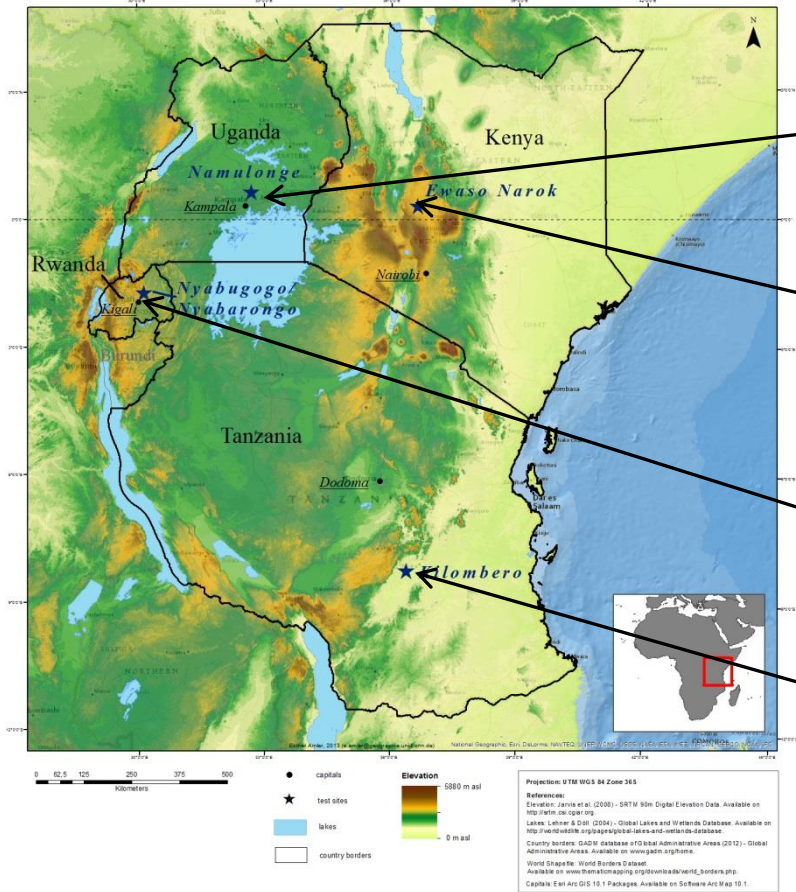


GlobE-Wetlands - Introduction



GlobE-Wetlands – Study Area

GlobE Wetlands - study area and test sites



The four focal wetlands:

Namulonge, Uganda
(inland valleys)

Rumuruti, Kenya
(floodplain)

Kigali, Rwanda
(inland valleys, floodplain)

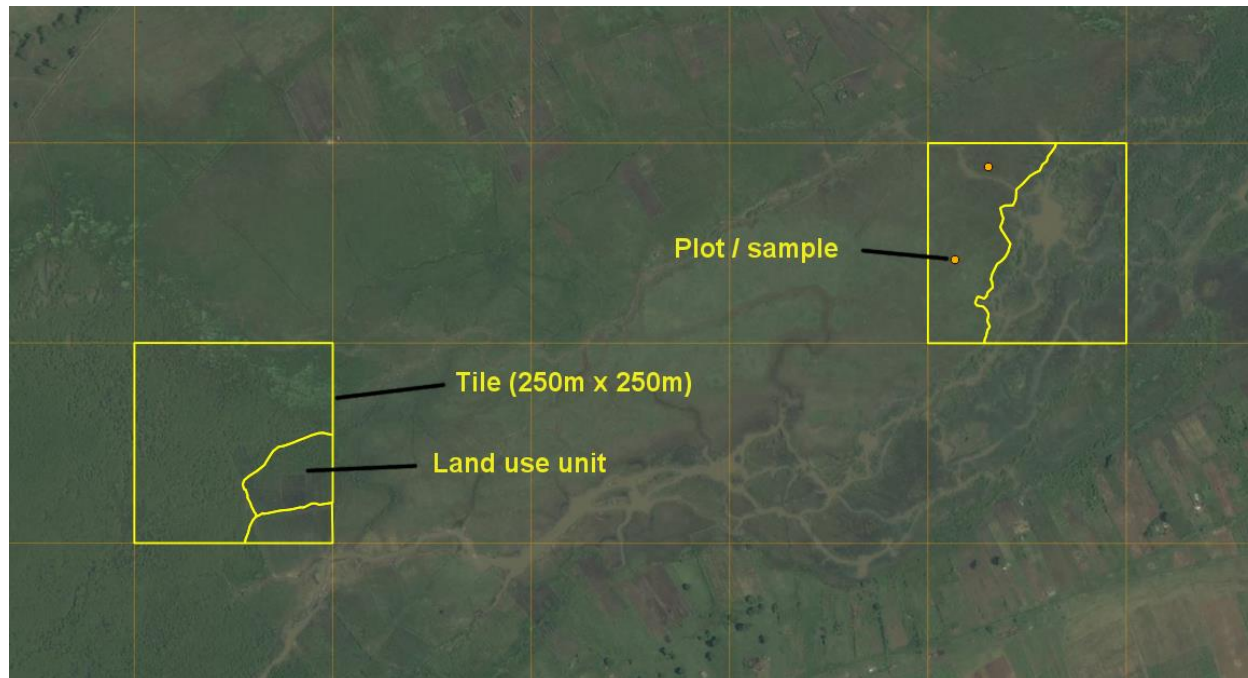
Ifakara, Tanzania
(floodplain)

GlobE-Wetlands

Randomly selected study tiles out of a grid laid over the focal wetland (250 m x 250 m)

Mapping of relevant land use units

Assessment of specific biophysical and socio-economic variables for each unit or in sampling plots (10 m x 10 m)



GlobE-Wetlands



Vegetation Based Index of Biotic Integrity

- Time- and cost-efficient
- Widely applicable
- Can be linked to vegetation databases
- Plot-Based



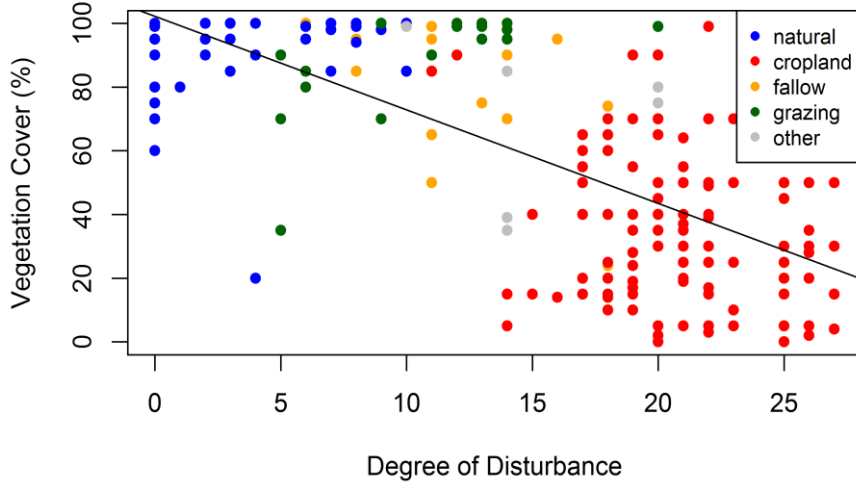
Vegetation Based Index of Biotic Integrity

Land use	+ Drainage intensity	+ Grazing intensity	+ Agriculture	= Degree of Disturbance
0-10	+ 0-10	+ 0-9	+ 0-10	= 0-39
unused grazing fallow (old) fallow plantation cropland Other	Drainage intensity	animal droppings	Soil disturbance, Use intensity, Input of fertilizers, manure and pesticides	

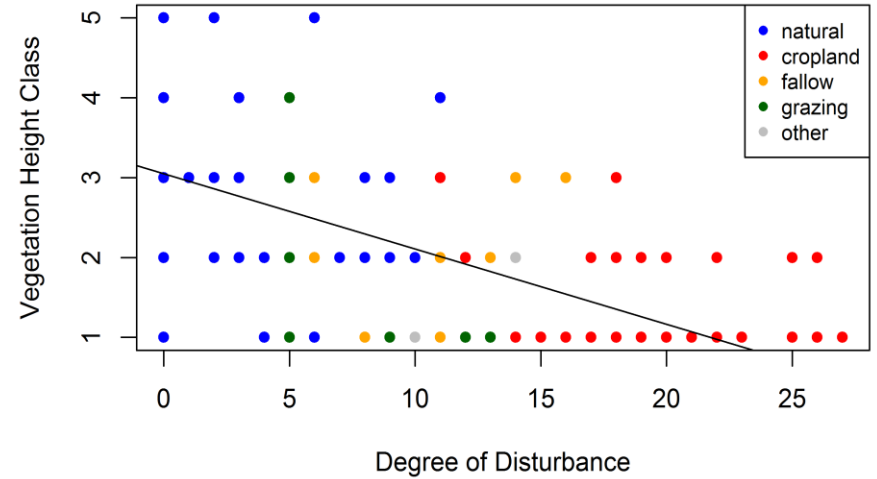


Vegetation Based Index of Biotic Integrity

Relation between Disturbance and Vegetation Cover



Relation between Disturbance and Vegetation Height



Spearman-correlation: **-0.71**

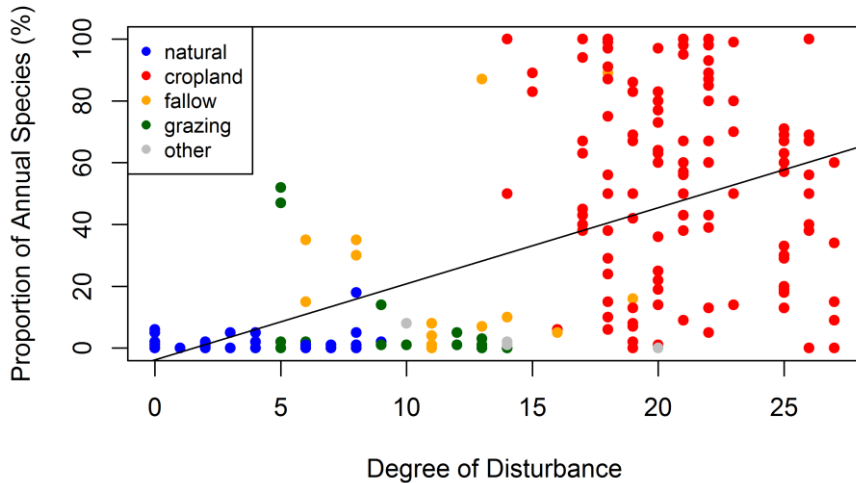
Adjusted R²: **0.50**

Spearman-correlation: **-0,70**

Adjusted R²: **0.52**

Vegetation Based Index of Biotic Integrity

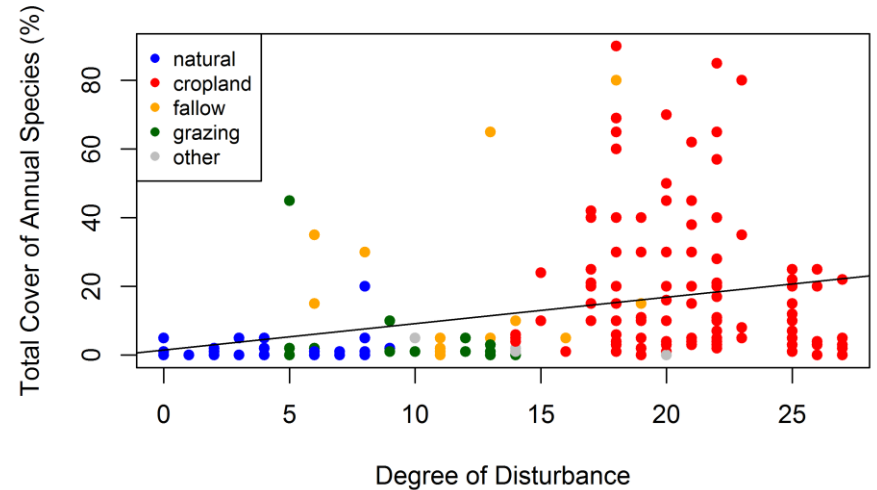
Relation between Disturbance and Annual Species



Spearman-correlation: **0.62**

Adjusted R²: **0.34**

Relation between Disturbance and Annual Species

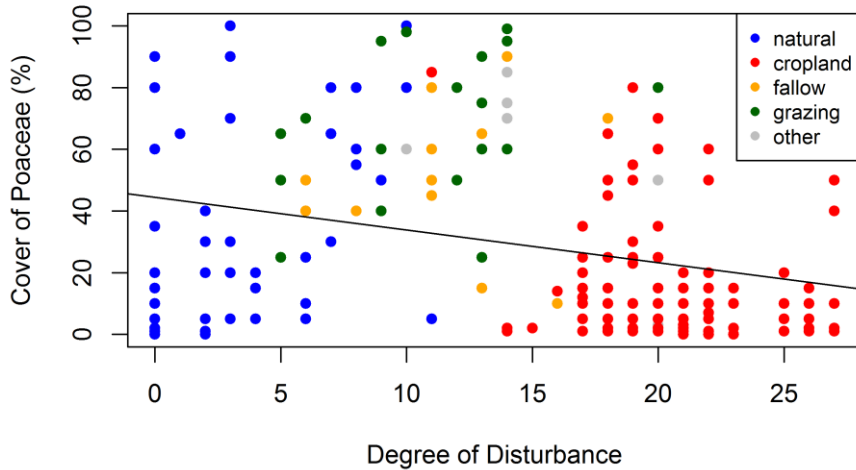


Spearman-correlation: **0.54**

Adjusted R²: **0.12**

Vegetation Based Index of Biotic Integrity

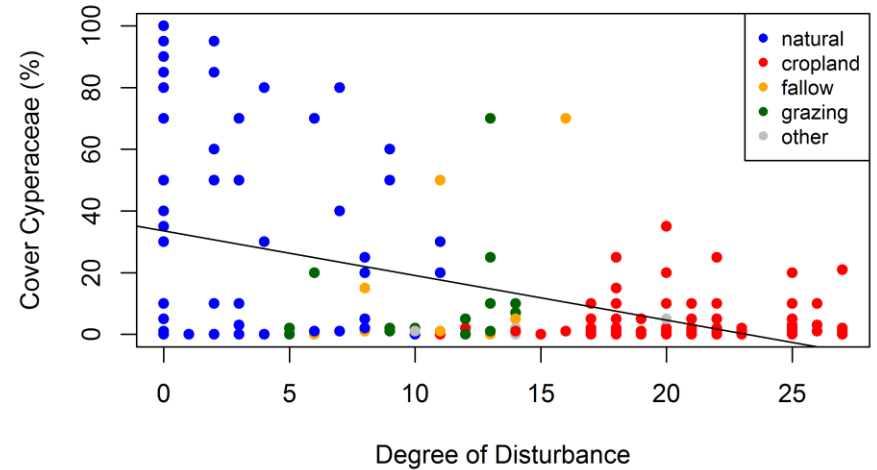
Relation between Disturbance and Poaceae



Spearman-correlation: **-0.34**

Adjusted R²: **0.09**

Relation between Disturbance and Cyperaceae

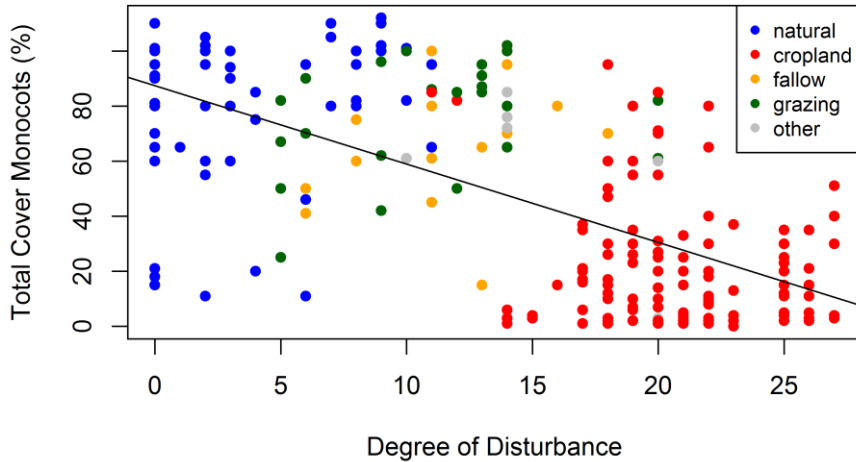


Spearman-correlation: **-0,31**

Adjusted R²: **0.25**

Vegetation Based Index of Biotic Integrity

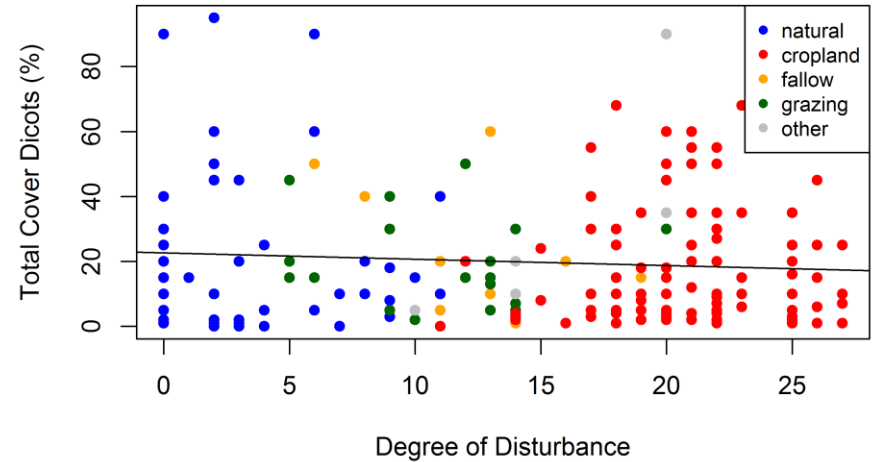
Relation between Disturbance and Cover Monocots



Spearman-correlation: **-0.65**

Adjusted R²: **0.43**

Relation between Disturbance and Cover Dicots



Spearman-correlation: **0.01**

Adjusted R²: **0.00**

Vegetation Based Index of Biotic Integrity

Disturbance

Vegetation Cover	Vegetation Height	Proportion of Annuals	Total Cover of Monocots
Adjusted R ² : 0.45			
	Adjusted R ² : 0.60		
		Adjusted R ² : 0.62	
			Adjusted R ² : 0.64

Testing the Index



Vegetation Cover	95	100
Height Class	4	3
Proportion of Annuals	0	15
Total Monocots	80	50
IBI-Score:	1.95	7.90

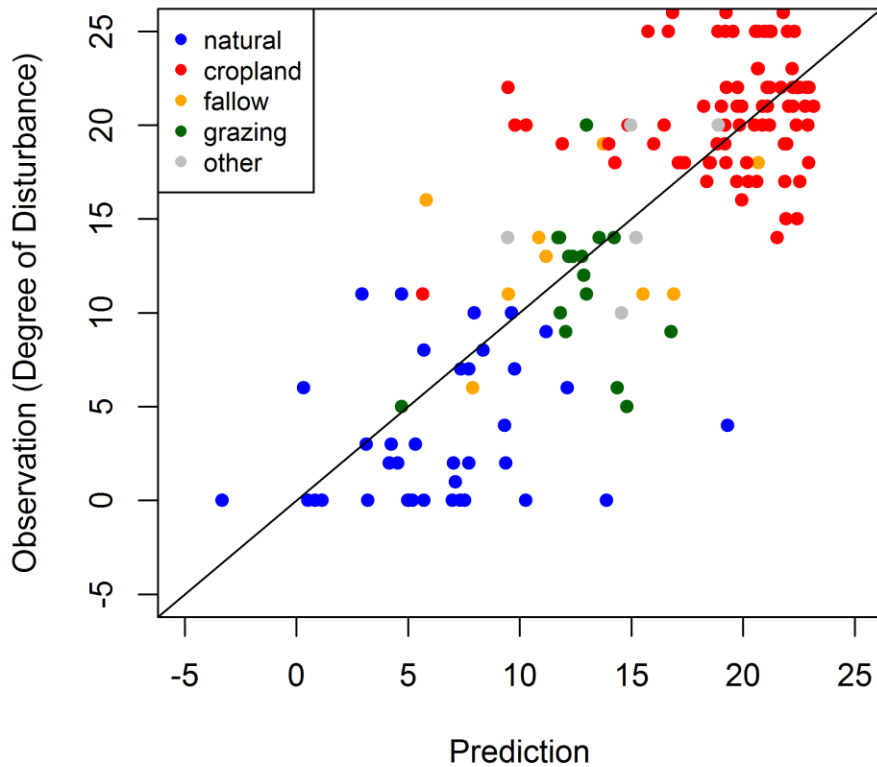
Testing the Index



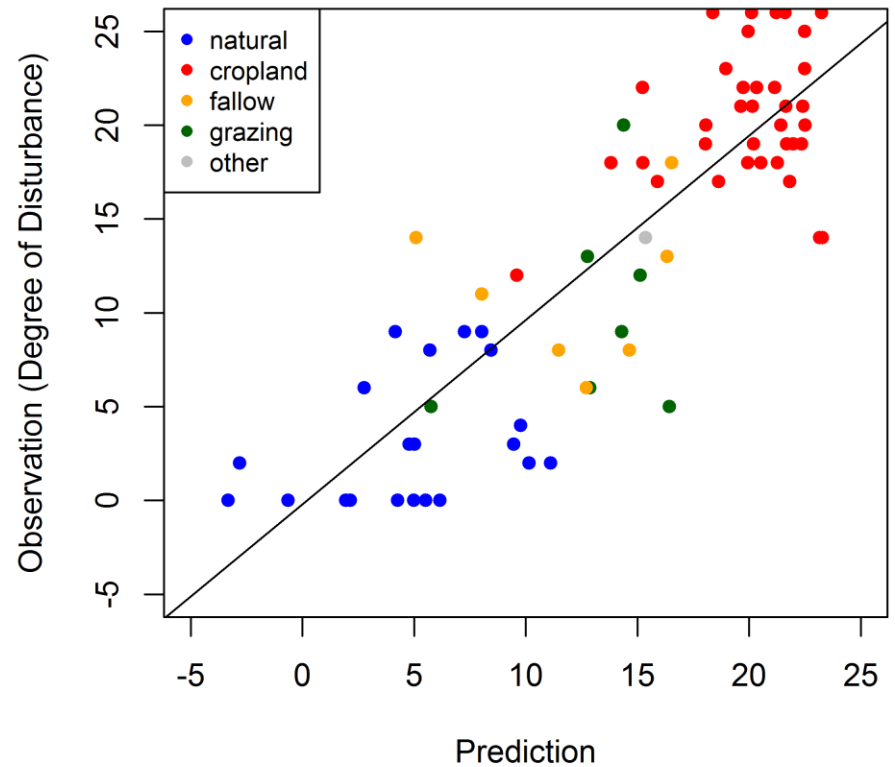
Vegetation Cover	90	30
Height Class	1	1
Proportion of Annuals	47	98
Total Monocots	50	3
IBI-Score:	16.44	22.41

Testing the Index

Prediction vs Observation (Calibration Data)



Prediction vs Observation (Validation Data)



Linking with Vegetation Databases

Header data	
Vegetation Cover (%)	80
Average Height (cm)	40
Species List	
Acmella caulirhiza	1
Ageratum conyzoides	2
Cyperus latifolius	3
Leersia hexandra	3

Reference List		
Acmella caulirhiza	Asteraceae	H
Ageratum conyzoides	Asteraceae	T
Cyperus latifolius	Cyperaceae	H
Leersia hexandra	Poaceae	Cr

**Import
to R**

**(or other
program)**

Linking with Vegetation Databases

List of Species	Cover	Cover_ percent	Monocot	Annual
Acmella caulirhiza	1	5	No	No
Ageratum conyzoides	2	15	No	Yes
Cyperus latifolius	3	37.5	Yes	No
Leersia hexandra	3	37.5	Yes	No

List of Vegetation Properties	IBI-metric
Vegetation Cover	80
Average Height	40
Total Monocots	75
Total Annuals	15
Total Perennial	80
Proportion Annuals	16

IBI-Score:

14.36

Conclusion

- Simple and fast method for assessing disturbance intensity of East African wetlands
- Gives acceptable results
- Can be linked with vegetation databases
- Possible modifications:
 - Classification of results
 - Specification according to natural reference vegetation

*Thank
You!*

