TITLE: Identifying drivers of protected area degradation
AUTHOR: Anupam Anand and NASA
UNIT: GEFIEO

March 19, 2009
GeoyEye-1

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February 1, 2009
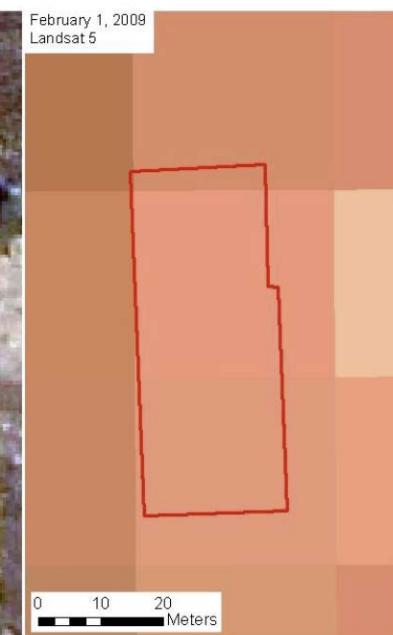Landsat 5

0   10   20
Meters

**High resolution**

Landsat

Challenge
To identify drivers of protected area degradation in Ria Lagartos Biosphere Reserve and Monarch Butterfly Sanctuary, Mexico
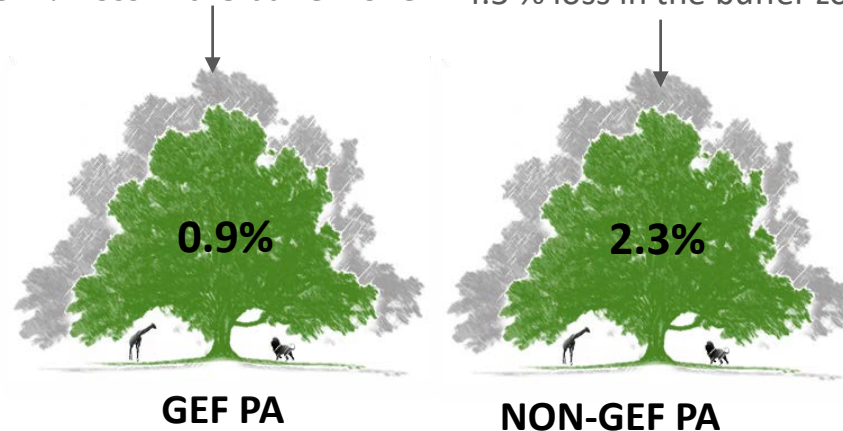
Geospatial Solution
Analysis of high resolution commercial satellite data in collaboration with NASA's Goddard Space Flight Center. Object based classification was used for change detection.

Impact
- Animal grazing and illegal mining were identified as the main drivers of Protected Area degradation

TITLE: Assessing forest cover loss in GEF supported PAs
AUTHOR: Anupam Anand
UNIT: GEFIEO
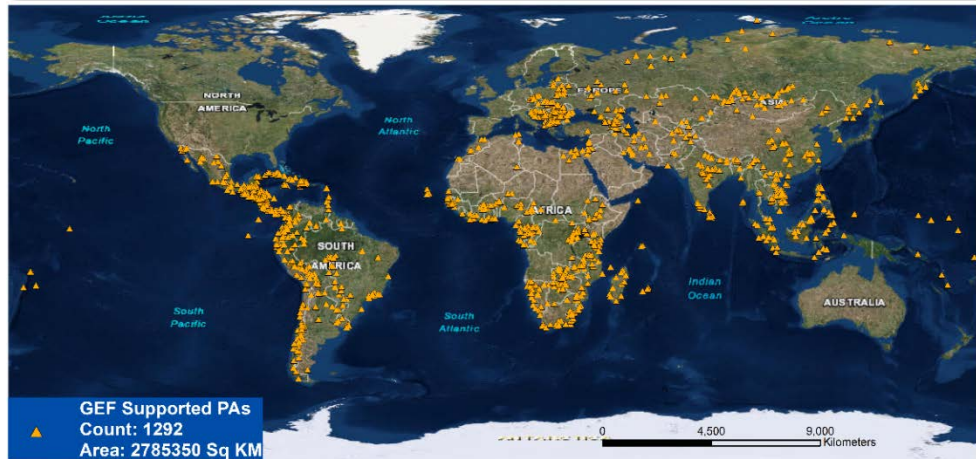
3.4 % loss in the buffer zone

4.5 % loss in the buffer zone

0.9%

2.3%

GEF PA

NON-GEF PA

Data are for 2001-2012, & within the same country and biome type

Percent Tree Cover (2000)

PA – 25km

PA – 10km

PA

High : 100
Low : 0

PA   PA-10km   PA-25km

%Forest (2000)   %Gain (2000-2012)   %Loss (2000-2012)

GEF Supported PAs
Count: 1292
Area: 2785350 Sq KM
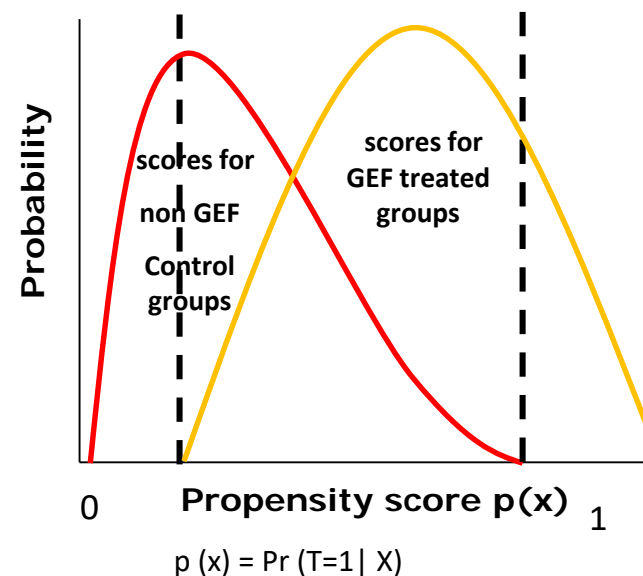
0   4,500   9,000
Kilometers
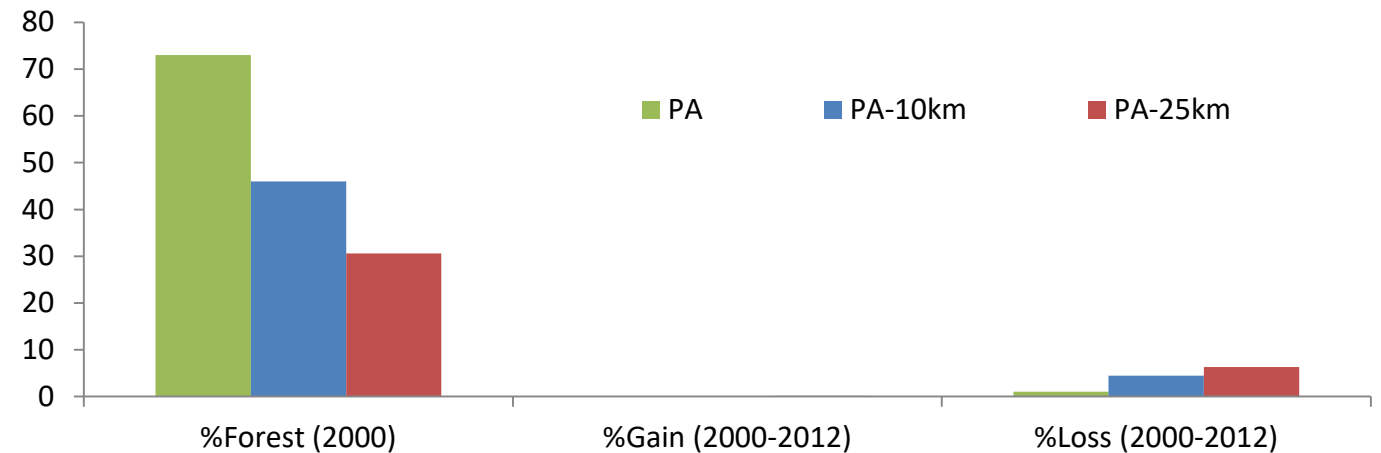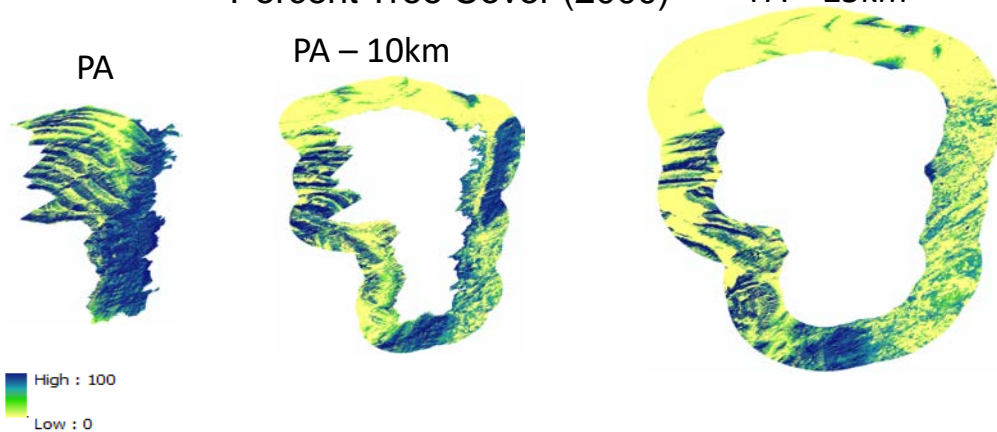
Challenge
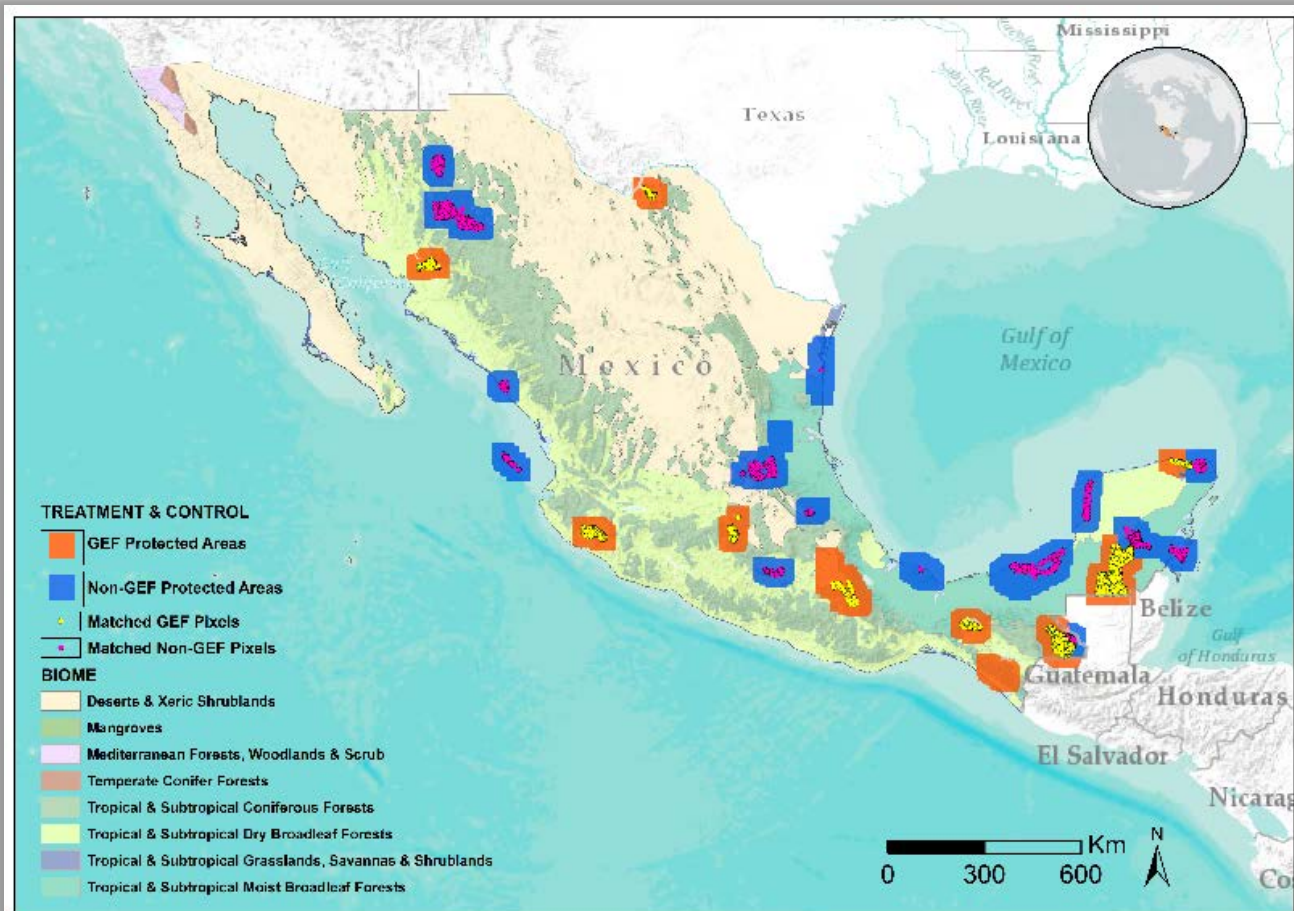Study the impact of Global Environment Facility (GEF) support to 1292 global Protected Areas (PAs) across 147 countries.

Geospatial Solution
Forest Change analysis within the PAs and at varying buffer distance. Forest change analysis done for a total of 30,000 PAs across 147 countries.
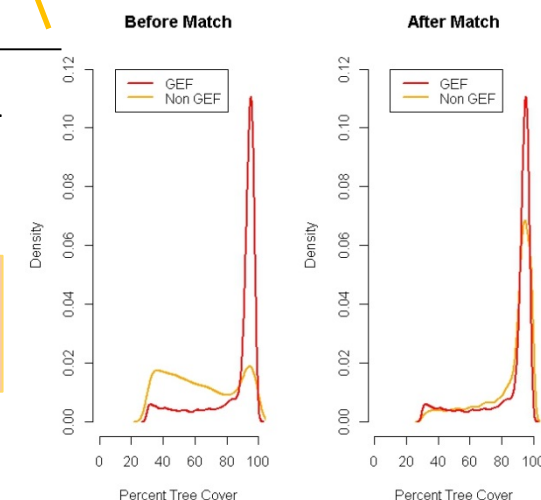
Impact
- Globally GEF PAs have slower forest loss
- The buffer zones of GEF PAs also have lower forest loss compared to non-GEF PAs

geospatial COP — development happens somewhere

IEO Independent Evaluation Office — GLOBAL ENVIRONMENT FACILITY

TITLE: Comparing the effectiveness of GEF support to PAs in Mexico
AUTHOR: Anupam Anand, Sumalika Biswas(UMD)
UNIT: GEFIEO

TREATMENT & CONTROL
- GEF Protected Areas
- Non-GEF Protected Areas
- Matched GEF Pixels
- Matched Non-GEF Pixels

BIOME
- Deserts & Xeric Shrublands
- Mangroves
- Mediterranean Forests, Woodlands & Scrub
- Temperate Conifer Forests
- Tropical & Subtropical Coniferous Forests
- Tropical & Subtropical Dry Broadleaf Forests
- Tropical & Subtropical Grasslands, Savannas & Shrublands
- Tropical & Subtropical Moist Broadleaf Forests

Km 0 300 600

Probability

scores for non GEF Control groups

scores for GEF treated groups

Propensity score p(x)

0 1

$p(x) = Pr(T=1\,|\,X)$

Propensity score matching for counterfactual selection

Before Match / After Match
Density — Percent Tree Cover
GEF / Non GEF

Challenge
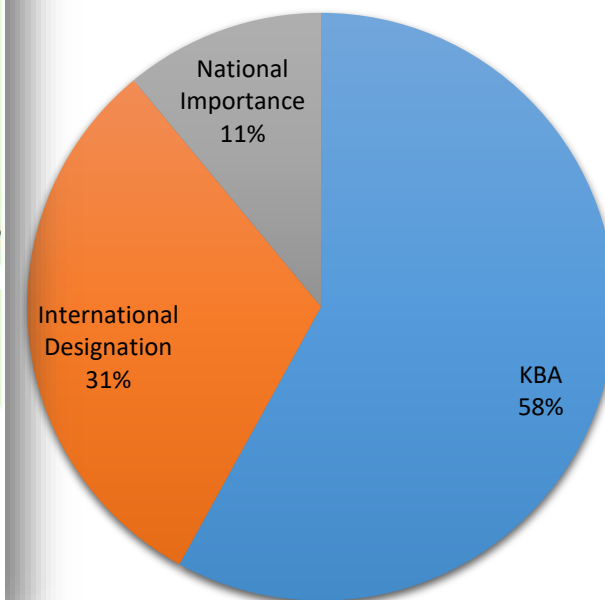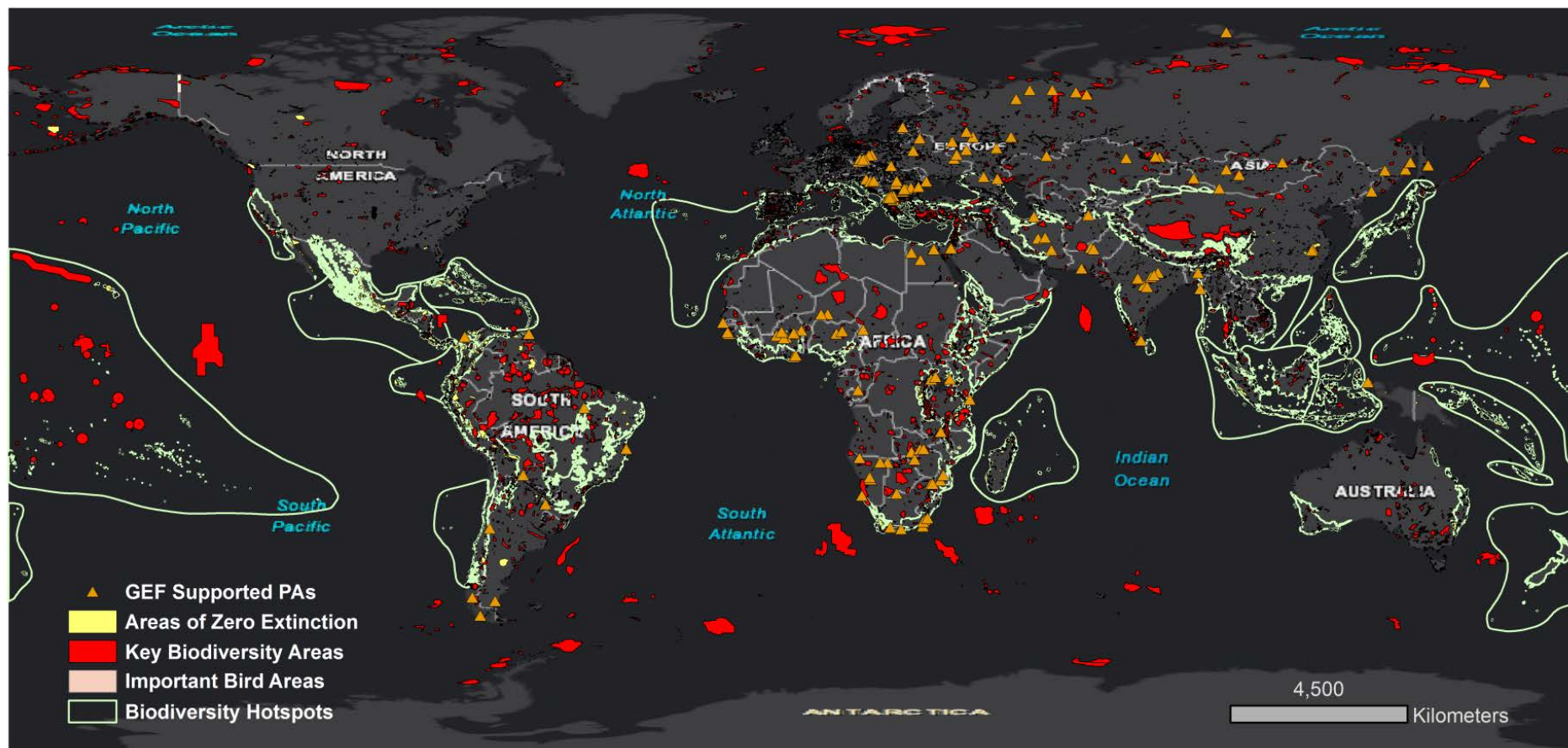To compare the impact of GEF support to Protected Areas in Mexico

Geospatial Solution
Forest Change analysis based on the counterfactual sites obtained through propensity score matching.

Impact
- In Mexico, 23% less forest loss in GEF PAs versus non-GEF PAs.
- In Mexico up to 28% avoided forest loss in tropical and subtropical coniferous forest biomes.

TITLE: Are the GEF supported Protected Areas also located in areas of high biodiversity?
AUTHOR: Anupam Anand
UNIT: GEFIEO

Legend:
- ▲ GEF Supported PAs
- Areas of Zero Extinction
- Key Biodiversity Areas
- Important Bird Areas
- Biodiversity Hotspots

Pie chart:
- KBA 58%
- International Designation 31%
- National Importance 11%

Challenge
Are the GEF supported Protected Areas also located in areas of high biodiversity?

Geospatial Solution
Spatial analysis based on important biodiversity areas such as KEY BIODIVERSITY AREAS - highest scientific designation conferred to areas with biodiversity of global significance.
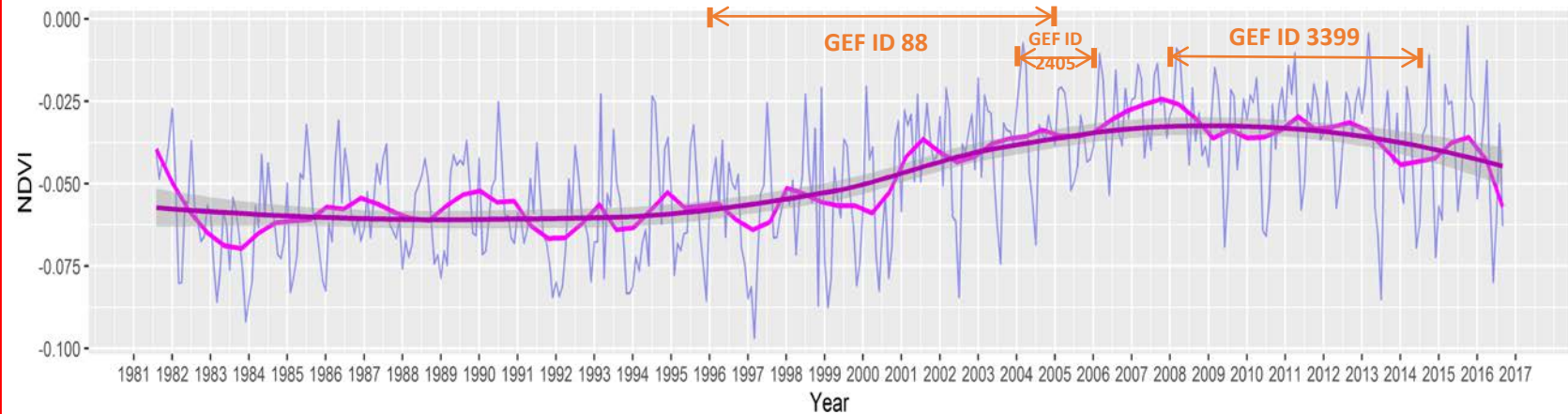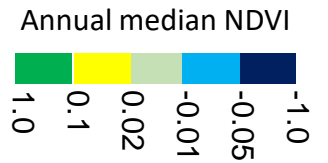
Impact
- 58 percent of GEF PAs are Key Biodiversity Areas
- 31 percent have other international designations such as Ramsar site & UN Heritage site.
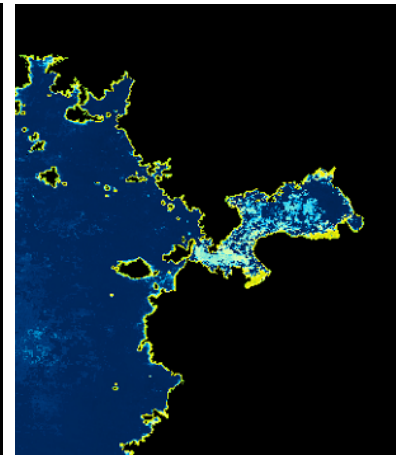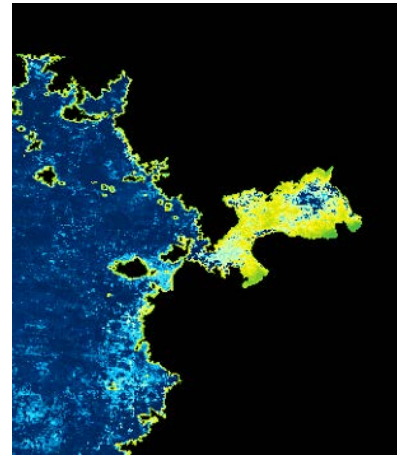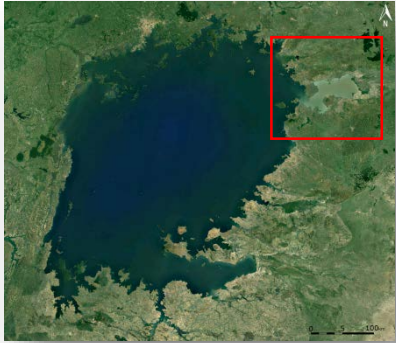
TITLE: Temporal changes in vegetation productivity over Lake Victoria
AUTHOR: Anupam Anand
UNIT: GEFIEO

Annual median NDVI

| 1.0 | 0.1 | 0.02 | -0.01 | -0.05 | -1.0 |

GEF ID 88   GEF ID 2405   GEF ID 3399

Challenge	**Geospatial Solution**	**Impact**
Assess the long-term impact of GEF support to the International Waters' projects at Lake Victoria which experienced severe eutrophication due to water hyacinth invasion beginning in the early 80s.	• Temporal decomposition of time series data • NDVI • Data from MODIS and GIMMS v3.	By 2016, the vegetation productivity* at Lake Victoria came down to around 20% of the levels in 1981. *Indicator for eutrophication

geospatial development happens somewhere

IEO Independent Evaluation Office GLOBAL ENVIRONMENT FACILITY

43.52 Tons carbon sequestered per hectare

$7,500000 Contribution from Sequestered carbon

TITLE: Value for Money Analysis for GEF land degradation projects
AUTHOR: Geeta Batra, Anupam Anand, Dan Runfola
UNIT: GEFIEO

Causal trees analysis

Value of sequestered carbon(US$)

Challenge
To estimate the value for money for the GEF land degradation projects

Geospatial Solution
Machine learning and propensity score matching using geospatial biophysical and socioeconomic data

Impact
- 43.52 tons carbon sequestered per hectare
- 108800 tons carbon sequestered per location
- $7,500000 carbon benefit (@USD12/ton carbon)