Floodplain-Wetland Mapping For Environmental Flows Assessment in the White Volta River Basin, Ghana

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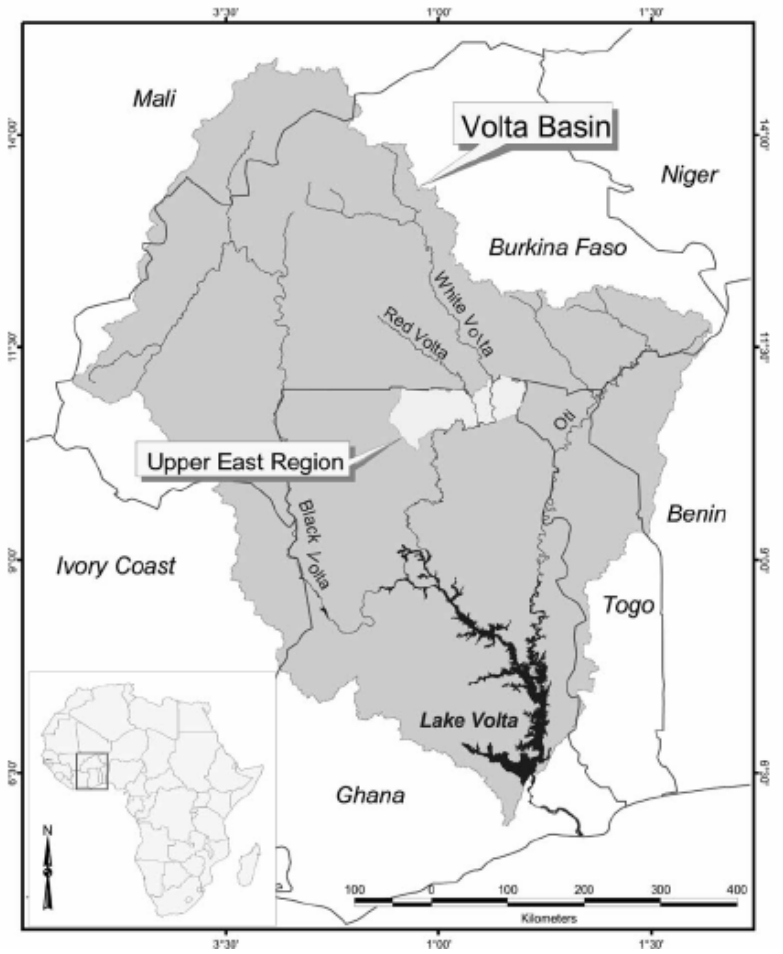
GLOWA-VOLTA Project

- Water resources assesment and sound decision support system for water resource sharing/usage (environmental flows) within the Volta River Basin
  - Ghana
  - Burkina Faso
  - Ivory Coast
  - Togo
  - Mali
  - Benin



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- Competing demands for water to support varied activities; irrigation, aquaculture, industry, etc (Environmental flows)
- The Ministry of Food and Agriculture in the Upper East Region expressed interest in Knowing about environmental flows within the basin
- To address the knowledge gaps in environmental flows on the floodplain wetlands difficulties are encountered,
  - due to lack of basic data, (eg. floodplain- wetland)
  - absence of studies to demonstrate the outcomes of flow allocations within the basin
  - limited understanding of the relationships between flow and other environmental components.

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- To provide the basic basic data on floodplain wetlands and demonstrate the outcomes of flow allocations within the basin
  - Remote sensing and statistical techniques
- In floodplain wetland mapping within the White Volta basin three (3) main stages were adopted;
  - extraction of hydrotopes (Hydrotopes are hydrologic distinct units within the landscape and behave in a hydrological uniform way),
  - points sampling (processing of points within STATA)
  - floodplain wetland extraction using logistic regression analysis.

Selected Hydrotopes

	ID	Description
Topographic	Slope	Slope in degrees [meters]
	Shape	Shape of the topography (Convex, Concave or straight) [meters]
	Wetness	Zone of Saturation [meters]
	Power	Stream Power Index [ ]
	Height	Elevation data derived from the SRTM-DEM [m]
	Internal	Internal relief [m/km^2]
Environmental	Ndvi	Normalized Density Vegetation index [-]
	Savi	Soil Adjust Vegetation Index [meters]
	Cover	Land cover classes derived from October, 2000 satellite image [-]
Climatic	Evapo	Evapotranspiration data calculated by using SEBAL [mm/day]
Image	Texture	Pattern in pixel brightness [-]
	LogB4	Logarithm Transformation of Band 4 of October, 2000 satellite image [-]
Spatial	Distance	Distance estimated from the main river [meters]

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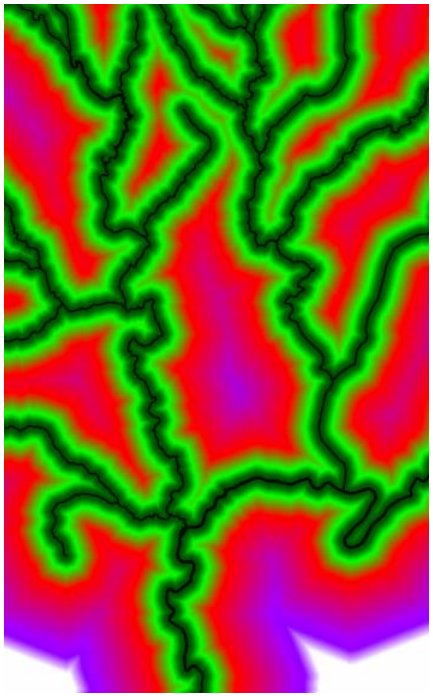
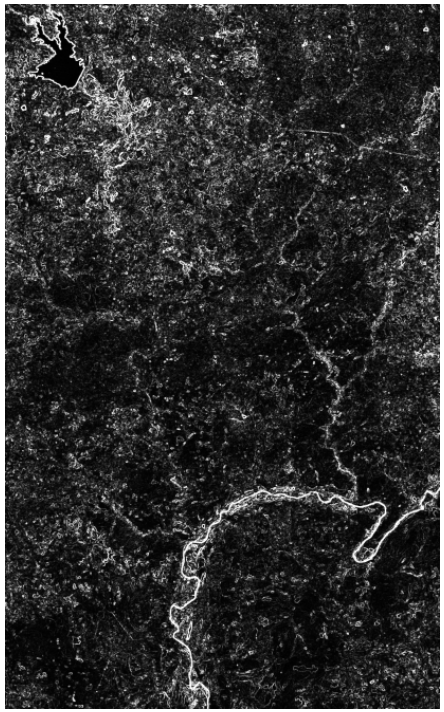
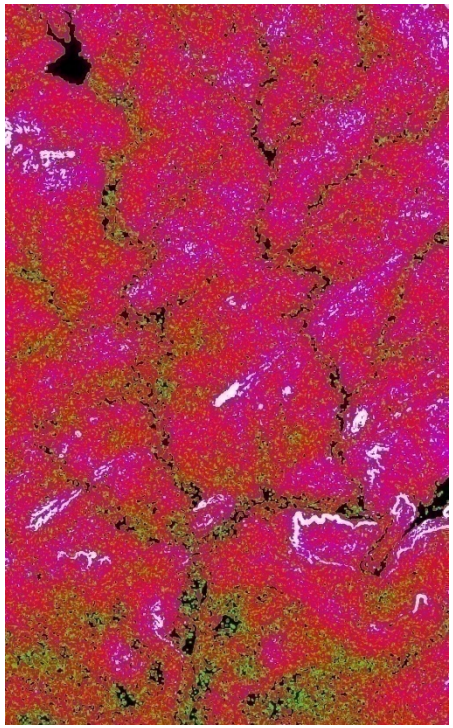
Data Types



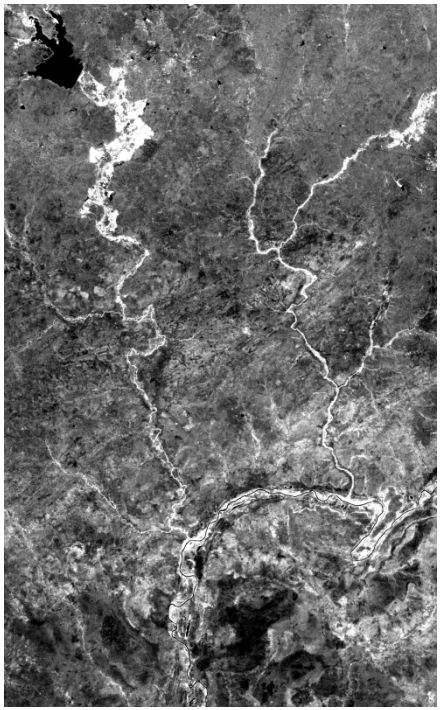
Distance



Texture



Internal
Relief



Evapotranspiration

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$$Logit(P) = \ln\left(\frac{P}{1-P}\right) = \beta_0 + \sum_{j=1}^{k} \beta_j x_{ij} + \varepsilon$$

$$Logit(P) = \left(\frac{P}{1-P}\right) = 20.78 + (0.0291 * texture) - (5.3 * \log B4) - (0.0007 * distance) - (0.38 * evapo)$$

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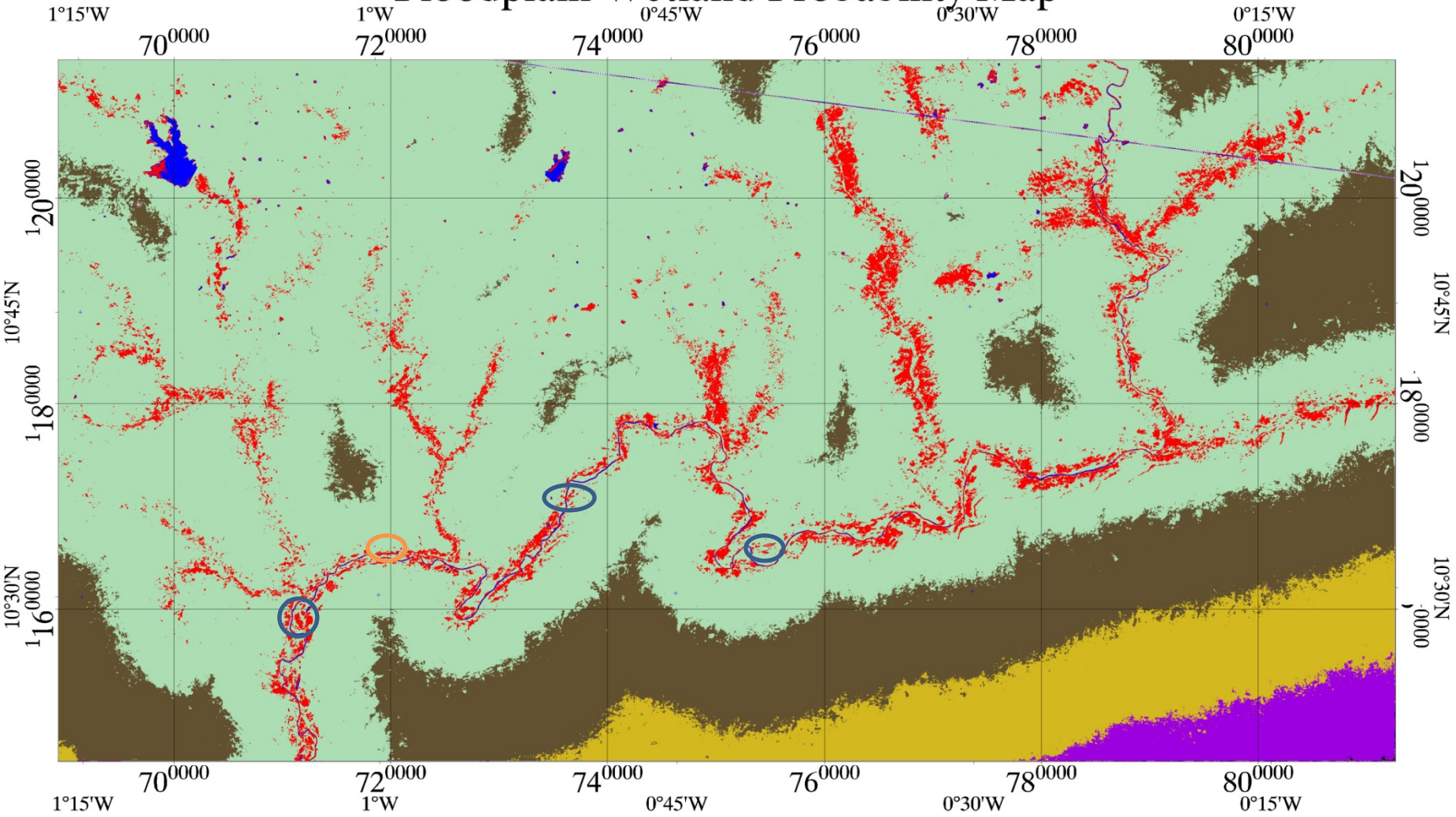
Floodplain Wetland Probability Map



Map Scale 1:510,000

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Conclusion

- To achieve moderate results it is effective to combine statistical method and remote sensing data
- The model perform well in locating the probable areas of floodplain wetlands using limited data (Ghana and some developing countries).

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Thank You