ESM 270P – Conservation Planning in Practice Fall 2016

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**Project Proposal**

**1. Planning problem**

The two most extensive biomes in Brazil, the Amazon Forest and the *Cerrado* (the Brazilian savanna), are subject to many fire events every dry season. Both biomes are well-known for their ecological and environmental importance but, due to the intensive human occupation over the last decades, they have been experiencing high deforestation rates with much of their natural landscape being converted to agriculture and pasture uses. The *Cerrado*, as a savanna, has naturally evolved adapted to fire, being considered a fire-dependent biome. Some authors state that this biome has been exposed to fire for the last 25 million years, forging the diversification of many C4 grasses species, for example. The Amazonia, as a tropical moist broadleaf forest, does not have similar characteristics and is classified as a fire-sensitive biome. Nevertheless, studies have shown that forest areas that have been already burned become more prone to experience recurrent burns. Forests patches that are close to open/converted areas have their edges exposed to more insolation and turbulences which helps to dry up its understory vegetation and litter, turning those areas more susceptible to fire events. In cases where grass species establishes in the understory they can be a renewable source of fuel for recurrent burns.

This project proposes to analyze a set of spatial data representing fire scars, climate variables and vegetation cover, to characterize the anthropogenic fire regime for the period between 2002 and 2011. Although, it will not access the intensity and the severity components of a fire regime. The chosen study site is a subset of the transition zone between the two above mentioned biomes, focusing in the State of *Mato Grosso* – Brazil, a region known for its high deforestation rates*.* There are protected areas and native people reserves that are under pressure by economical activities, fire being an important driver of the natural vegetation conversion. Knowing the fire history of a region would help to pinpoint areas with higher human activities, allowing to prioritize those where fire management should focus on. It also could help to identify areas where farm’s reserves (*reserva legal*), required by the Brazilian environmental law, should be allocated in order to more effectively conserve the environment and assure connectivity between the remnants patches.

**2. Overall planning goals and objectives**

The overall objective is to prioritize areas for wildfire management by identifying the spatial-temporal patterns of the human induced fire regime. This would be used as an indicator to find out areas that are more likely to show higher anthropogenic pressure and vegetation disturbances. It is known that in the forest frequent burned areas are more prone to edge effects and subject to invasive species, just to point out some examples. In the savanna, those areas have their natural physiognomies modified, giving successional advantages to grass species over bushes and trees species.

**3. Specific project objectives, general approach and specific methods**

By overlaying fire scars layers it would be possible to classify fire recurrence. This analyses would allow ranking the areas where to concentrate firefighting and management efforts. There are also natural reserves in the study site that suffers with wildfires, and those protected areas could also take advantage of this type of analyses to stablish firefighting and management plans, preventing economic and environmental losses they might cause.

Later on, it would be applied a zoning analysis using fire recurrence, vegetation and climate spatial data aiming to identify the different human-induced fire regimes. This analysis would indicate where fire should be avoided or minimized and where it should be managed in a way to simulate its natural regime.

**4. Data needs**

The fire scars layers are still being generated by applying Spectral Mixture Analysis (SMA) to Landsat 5TM imagery during a time window of 10 years (2002-2011). Other spatial data would be used to support the analyses: Vegetation indices, such as Normalized Difference Vegetation Index (NDVI), Enhance Vegetation Index (EVI) and/or Leaf Area Index (LAI), could be used as a proxy for NPP and, thus, help to characterize the vegetation gradient over the study area; Precipitation and Cumulative Water Deficit (CWD) could be used to better characterize vegetation water stress, a proxy for propensity to burn.

**5. Anticipated product**

The product for this project would a wildfire zoning plan created by crossing the fire recurrence, the vegetation and the climate spatial data. The fire recurrence layer would indicate how often the vegetation was burned over time, helping to describe the anthropogenic fire regime for the study site, characterizing wildfire in space (where it burned), time (human-induced seasonality), and extension. The vegetation and climate data would be added to help characterize the modified fire regime and delimitate wildfire management zones.