# Ecological Indicators in a Derived Savanna Disturbed by Oil Spillage and Vegetation Fire in Nigeria

Emmanuel Nzegbule
*Michael Okpara University of Agriculture, Nigeria*



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# Ecological indicators in a derived savanna disturbed by oil spillage and vegetation fire in Nigeria

*Nzegbule Emmanuel*
*College of Natural Resources and Environmental Management , Michael Okpara University of Agriculture Umudike , PMB 7267 Umuahia , Abia State , Nigeria .E-mail : nzegbule@ yahoo .com*

**Key words :** Savanna , oil spillage , fire , change indicators

**Introduction** Guinea and Sudan savannas covering about 546 ,400 sq . km . , representing 60% of the entire Nigeria's land mass , harbor a significant proportion of Nigeria's population who are engaged mainly in nomadic and arable farming and are where a larger proportion of Nigeria's domestically grown food is produced . Oil pipelines that transverse these grasslands are frequently subjected to vandalization by restive youths which cause oil spillage and vegetation fire ( NEST ,1991) . This study examined the indicators of this growing ecological problem in Nigeria's savannah ecosystem .

**Materials and methods** The investigation was carried out in a community with a derived savanna vegetation near Ovim , Abia State , Nigeria where there was oil spillage and vegetation fire on a land area covering about 3 ha in 2003 . Starting from the point of punctured pipeline 2 transects were cut perpendicular to each other and transversing the fire burnt area passing through a border area and reaching the unaffected adjacent plot . Along each transect , sample plots with size of 5m × 5m were created and replicated at 3 points using an interval 20 m on both the affected , border and unaffected areas . In each sample plot vegetation survey was done to identify , enumerate and classify species according to families and lifeforms . Twenty gram soil samples were also collected at 0-15 cm and 15-30 cm soil layers from all the sample plots and analyzed in a laboratory for N ; P , K ; Organic Carbon ; pH ; Fe and Pb using appropriate analytical methods . The data collected from soil were later statistically analyzed .

**Results and discussions** The mean total population of plant species in the unaffected , border and affected plots were 5406 .25 , 5007 .5 and 6435 plants/ha respectively . In terms of family representation 7 , 10 and 16 families were encountered in the affected plot , border and the control plots respectively . Although the area affected by oil spillage and vegetation fire had higher plant population density than the other 2 areas surveyed yet it had less species diversity . *Bracharia deflexi* , *Ipomea involucrata* and *Pennisetum polystachion* were the most abundant species but they existed in the 3 plots .*Andropogon gayanus* , *Perotis indica* , *Adiatum caudatum and Schizachyrum exile* were 4 plant species with occurrence only in the land area affected by oil spillage and vegetation fire , and they appear to be adapted to the changed environment which could have significance in any planned land resuscitation . Re-growths of wood species were not encountered in the area affected by both oil spillage and vegetation fire unlike where the savanna disturbance was vegetation fire alone . Chamaephytes dominated the affected area .
The soil pH was reduced to 6 .01 in the affected plots compared to the unaffected plots and this continued to the deeper soil level (5 .43) . Magnesium level was significantly lower in both 0-15 and 15-30 cm soil depths . The pattern would have been the reverse if the disturbance was from vegetation fire alone which releases Mg from the ash products into the soil . The N and K levels were 0 .044% and 0 .071 Cmol/kg respectively at 0-15 cm in the area affected by oil spillage and fire ; and these were significantly lower than that of unaffected plots . The reduction in N content by oil spillage and vegetation fire was not limited to 0-15 cm alone but extended deeper into soil ( 15-30 cm) . Levels of P and organic carbon were significantly low in both the border and control plots when compared with the area affected by oil spillage and vegetation fire . The oil products , which in itself contained hydrocarbons , spilled in the disturbed area apparently contributed to the observed increase in the level of organic carbon . The observed impacts on most soil parameters manifested at 15-30 cm which were different from reports of ordinary vegetation fire alone whose effects were restricted to the initial 0-10 cm depth ( Tongway and Hodgkinson , 2000) but that of oil-fueled fire penetrates deeper and persist for a longer period in the soil ( Al-sawari et al , 1998) . The concentrations of Fe and Pb (mg/kg) at both 0-15 and 15-30 cm soil depths were all significantly higher in the disturbed area than either the border or control plots . Fe and Pb in the affected plot were 76% and 400% higher than the control plot at 0-15 cm soil depth . The involvement of oil spillage in the fire disturbance of the derived savanna of a community near Ovim in Abia State Nigeria , made the vegetation and soil to respond differently in terms of reach and they need to be accommodated in subsequent land use management .

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