**IMPACT OF DEFORESTATION ON ECOSYSTEM: A CASE STUDY OF THE FRESH WATER SWAMP FOREST IN ONNE, NIGER DELTA REGION, NIGERIA**

**G.E. OMOKHUA[1*] AND A.O. KOYEJO[2]**
**[1]Department of Forestry and Wildlife Management**
**Faculty of Agriculture University of Port Harcourt, Nigeria**
**[2]Swamp Forest Station, Forestry Research Institution of Nigeria, Onne Rivers State**
**\*Corresponding author's Email: omokhuag@yahoo.co.uk**

**ABSTRACT**

*The Niger Delta region of Nigeria is endowed with the freshwater swamp forest, which is one of the richest ecosystems of the world. The ecosystem through its species diversities play pivotal role at local and global levels by shaping the environment, and influence local climate conditions. The coastal vegetation has been beleaguered by deforestation at an alarming rate. This paper takes a look at the impact of unregulated and uncontrolled removal of vegetation due to human economic activities in Onne freshwater swamp forest. In this study, the mean area of land covered by flood waters was 0.55 ha for the deforested land compared to the non-deforested land which had a mean of 0.25 ha. Similarly, the mean air temperature for the deforested portion was $28.48^0C$ while that of the non-deforested area was $23.47^0C$ respectively. This study revealed that the rate of deforestation of the natural freshwater swamp forest in Nigeria has led to situation whereby the rich ecosystem  is threatened by devastating floodwaters and rising air temperatures.*

Key words: impact, deforestation, ecosystem, freshwater swamp forest

**INTRODUCTION**

The Fresh water swamp forests are wetland ecosystems. The ground is very irregular with frequent patches of open water in the dry season. They are usually flooded in the rainy season. In the Niger  Delta region of Nigeria, they constitute a fringe of coastal vegetation after the mangroves.  They are usually associated with rivers or streams that feed into the mangroves or sea. (Keay, 1989). Fresh water habitats constitute only about 2.1% of the earth surface (Raven and Johnson 2002). They are variable in size, form and plant community structure (Chapman and Reiss, 1995). The freshwater swamp forests are store houses of biological diversity. They are one of the most productive ecosystems of the world and provide suitable habitats for both plant and animal species. Also, they help in regulating coastal water flow and elimination of silt, sediment and pollutants from moving water (Asthana and Asthana, 2003).

The Freshwater swamp forest in Nigeria seldom exceed 30m in height Dominant tree species include: *Symphona globulifere, Mitragyna ciliata Spondianthus preussii, Lophoira alata, Anthostema aubryanum, Alstonia congensis Nauclea gilletii, Berlina auriculata, Grewia coriacea, Cleistopholis patens, Uapaca species, Oxystigma mannii and Ficus specis. The outer fringe is dominated by Raphia hookerri and Lonchocarpus griffonianu (*Keay*,1989).*  Climbing palms, lianas and many floating communities are characteristics of the freshwater swamp forest.

The Freshwater swamp forest which was initially protected from deforestation because of its relative inaccessibility arising from the swampy nature of the ecosystem is now being destroyed at an alarming rate in the Niger Delta region of Nigeria. This has become a very big problem. Nigeria is however witnessing an unprecedented rate of deforestation, thereby undermining economic growth, exacerbating poverty and contributing to environmental degradation (Akinsami, 2006). The basic reasons for such extensive deforestation are:

expansion of agriculture, fuel wood collection, pole and timber harvesting, urbanization as well as petroleum exploration and exploitation. The consequences can be summed up as: soil degradation and erosion, destruction of habitats and a valuable sink for pollutants, and climate change. Therefore, the objectives of this study were to: determine the area of coastland covered by floodwaters in Onne Fresh water swamp forest and to evaluate changes in atmospheric temperatures due to deforestation.

## MATERIALS AND METHODS
### Study Area
The study was conducted in the Freshwater swamp forest in Onne, South-south, Nigeria. The area is located in Lat $4^0$ 50N and Long. 7.03E. Annual rainfall is 2500mm, with a mean value of 75% relative humidity in February and 80% in July. The mean minimum temperature is $25^0$C and the mean maximum is $29^0$C (ICRAF/IITA, 1994). The site is about 4km from the Federal Ocean Terminal at Onne.

### Data Collection and Analysis.
Three (3) experimental plots of 100m x 100m each were established along the outer fringe of the Freshwater swamp forest in Onne. The plots were established on both deforested and non-deforested area and assessed between 2004 and 2006. The initial distance covered by water was observed and marked out at every 10m of each experimental plot due to irregular around. Weekly observations and recordings were made during the rainy season from April to October for any increase in area covered by floodwaters. The data were analyzed using one-way Analysis of variance and the means were separated by use of least significant difference (LSD)

Mean air temperatures were also measured in deforested and non deforested areas of the forest ecosystem between 2004 to 2006. Three (3) experimental plots of 100m x 100m were established in the area of active deforestation within the transition zone. Similarly, another 3 experimental plots of 100m x 50m were also established in the core zone of non-deforested areas. Measurements of atmospheric temperatures were carried out on daily basis from April to October of each year. Data on temperature were recorded at 5 points of 4 levels above the ground in each experimental plot between 13 hrs and 14 hrs GMT as $^0$C. The levels were: ground surface, 1m, 3m, and 3m above the ground respectively. ANOVA was used in data analysis and LSD was used to separate the means.

## RESULTS
The area affected by coastal floodwaters is shown in Table 1. There were significant differences in area of land covered by flood waters in hectares between the deforested and non-deforested areas at 5% level of probability. Annual estimate of areas affected by coastal floodwaters in the deforested areas were 0.52ha, 0.48ha and 0.64 ha for 2004, 2005 and 2006 rainy seasons respectively. While the non-deforested areas had a mean of 0.19 ha, 0.18 ha and 0.16 ha of flood water affected areas respectively. Mean atmospheric temperatures in the deforested and non-deforested areas are shown in Table 2. Significant differences also occurred between the 2 areas at 5% level of probability. Mean air temperatures were $23.5^0$C, $23.17^0$C and $24.17^0$C in the non-deforested area for 2004, 2005 and 2006 seasons respectively. On the other hand, in areas of massive deforestation, the average air temperatures were $28.74^0$C, $28.26^0$C and $28.43^0$C for 2004, 2005 and 2006 seasons respectively.

**Table 1: Annual estimate of area affected by floodwaters in Onne (ha)**

| Area | Year | | |
|---|---|---|---|
| | 2004 | 2005 | 2006 |
| **Deforested** | 0.52b | 0.48b | 0.64b |
| **Non-deforested** | 0.19a | 0.18a | 0.16a |
| **Total** | 0.73 | 0.66 | 0.80 |

*Means with similar letter do not differ at 5% level of probability.*

**Table 2: Mean air temperature in deforested and non-deforested areas of Onne Freshwater swamp forest ($^0$C)**

| Area | Year | | |
|---|---|---|---|
| | 2004 | 2005 | 2006 |
| **Deforested** | 28.74b | 28.26b | 28.43b |
| **Non-deforested** | 23.05a | 23.17a | 24.19a |

*Means with similar letter do not differ at 5% level of probability.*

**DICUSSION**

Deforestation is a major problem in Nigeria. The rate of destruction of the Freshwater swamps is particularly very high due to urbanization, oil exploration and exploitation, increased cultivation of land as well as uncontrolled and unregulated fuelwood, timber and pole harvesting. Deforestation is one of the major causes of global warming. About 81.5 billion metric tons of carbons are added into the atmosphere annually out of which about 3.5 billion metric tons are contributed by deforestation, fossil fuels, organic matter, forest fire and other human activities. (Asthana and Asthana, 2003). As a result of deforestation, enormous quantities of carbondioxide are set free, contributing significantly to rising global temperatures. Consequently, the ecological characteristics of the Niger Delta region has been affected by climate change and sea level rise leading to flooding and submergence of some cities, towns and villages in Nigeria. Ecological consequences of deforestation especially in the tropical world have been discussed by various authors (Akachuku, 1997, 1999, 2006; Asthana and Asthana 2003; Adedire, 1991; Awosika 1994; Ojo, 1996). Deforestation by man leaves the ground surface bare. The gradual soil erosion on the outer fringe of the freshwater swamps in Onne aggravated flooding and soil loss at the site. The total area covered by floodwaters for both the deforested and non-defrosted areas were 0.73ha, 0.66 ha and 0.80 ha for 2004, 2005 and 2006 seasons respectively. The deforested areas had higher values of flood-covered land than the non-deforested areas (Table **1**). This is because with the forest cover gone, the erosive action of floodwaters loosen the top soil which was gradually carried away and deposited else where.

In the deforested area, inadequate forest cover kept the atmospheric temperatures higher compared to the non-deforested area. At all levels of temperature measured, lower temperatures were recorded in the zone of non-deforestation, with a mean of 23.47$^0$C, compared to the deforested area which had a mean of 28.48$^0$C.

Any rise in global temperature and sea-level however mild, could cause serious problems for mankind. For instance, in October 2006, many coasted communities in South-south, Nigeria were submerged and flooded and many people were rendered homeless. With a mean atmospheric temperature of 28.48$^0$C recorded in the deforested area, the development of tropical storms such as typhoons and hurricanes may be inevitable in the Niger Delta. Consequently, about 6 to 8 million people may be rendered homeless.

**CONCLUSION**

Global change arising from deforestation is real. The natural resources which sustain human life are degenerating at a fast rate due to man-made activities. Conservation linked economic development aimed at strengthening our resource base to meet the needs of present and future generations should be vigorously pursued. Therefore, conservation of the freshwater swamp forest to approach a turning point in global change should involve implementation of all legislation against deforestation. It should also involve the prevention of unregulated and uncontrolled removal of vegetation and reforestation of the all forest types with both indigenous and exotic species in Nigeria.

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