Dead Wood in Hardwood Forests of Vicksburg National Military Park

Daniel J. Twedt

U.S. Geological Survey, Patuxent Wildlife Research Center, Vicksburg, MS 39180

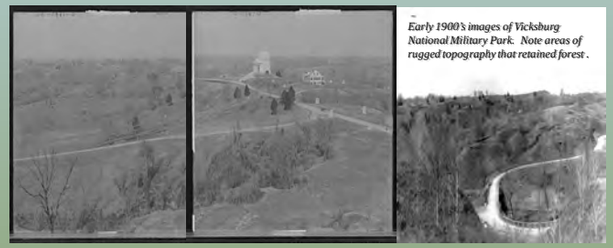
INTRODUCTION

The loess plain physiographic region extend circa 750 miles along the edge of the Mississippi Valley. Distinguished by deep, fertile, aeolian soils, these loess bluffs have rugged topography where abundant rainfall results in severe erosion.

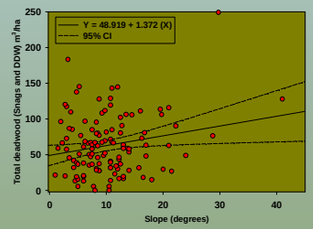
The mesic hardwood forests that dominate bluff vegetation are impacted by erosion, exurban encroachment, conversion to pine forests, and invasion of exotic plants. Historically, many areas have been converted to agriculture, although the steepest areas not suitable for cultivation escaped deforestation. In many areas, including Vicksburg National Military Park, erosion spurred abandonment of agriculture and subsequent return of hardwood forest.

To understand the historical distribution of forest clearing within this Park, I evaluated the relationship between steepness of slope and 1) maximum diameter of live trees, 2) density and volume of standing dead trees (snags), and volume of down dead wood (DDW). My hypothesis was that areas with steeper slope would not have been deforested and would therefore have larger diameter trees and greater volume of dead wood than areas with more moderate slope. Also, snags would be less prevalent on steeper slopes as erosion destabilizes soils.

Study plots were located in mesic upland hardwood forest.

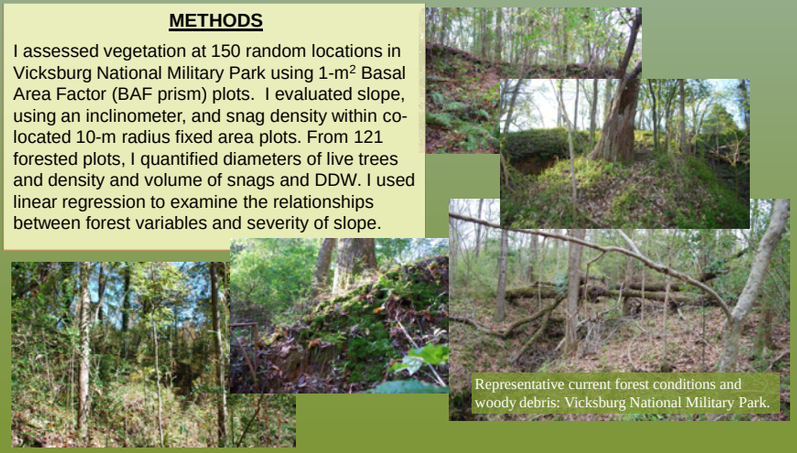


Early 1900's images of Vicksburg National Military Park. Note areas of rugged topography that retained forest.



METHODS

I assessed vegetation at 150 random locations in Vicksburg National Military Park using 1-m^2 Basal Area Factor (BAF prism) plots. I evaluated slope, using an inclinometer, and snag density within co-located 10-m radius fixed area plots. From 121 forested plots, I quantified diameters of live trees and density and volume of snags and DDW. I used linear regression to examine the relationships between forest variables and severity of slope.



Representative current forest conditions and woody debris: Vicksburg National Military Park.

RESULTS

Density of snags (>10 cm dbh) per ha was 38.5 ± 4.4 (SE), volume (m^3/ha) of DDW (>6 cm diameter) was 43.1 ± 3.2, and total volume of deadwood (DDW + snags) was 63.1 ± 3.7.

Linear regressions failed to detect relationships between steepness of slope and maximum tree diameter, volume of down dead wood , or density or volume of snags ($P > 0.08$). Total volume of dead wood (DDW + snags) was positively related to slope ($P = 0.02$), but the relationship was poor ($R^2_{adj} = 0.04$).

High proportion of standing trees that were dead for 5 'pioneer' species suggests succession to more mature forest conditions.

Species	% Basal Area (all trees)	% standing trees of species dead.
5 most common (Basal area) trees		
Sweetgum	15.3	3.7
Water oak	14.1	6.8
Boxelder	10.5	6.6
Elm spp.	9.2	7.9
Sugarberry	8.2	7.4
5 species with greatest mortality		
Black locust	4.1	30.6
Black cherry	1.5	10.0
Sassafras	1.4	23.9
Eastern red cedar	1.2	55.0
Honey locust	0.7	22.7

CONCLUSIONS

Lack of a relationships between slope and large diameter trees or volume of dead wood, indicates an inability to evaluate former land use based on these parameters.

Disproportionate mortality among early-successional tree species suggests successional maturation of these upland hardwood forests.

I thank A. Ayala, E. Ray, M. Schickel, H. Sullivan, for field assistance. I also thank V. Dubowy and M. Segura, National Park Service for logistic and operational support.