



# Chinquapin Oaks on Bloody Hill, Wilson's Creek National Battlefield, Missouri

Natural Resource Data Series NPS/HTLN/NRDS—2011/155



**ON THE COVER**

Chinquapin oak (*Quercus muhlenbergii*)

Photograph by: Karola E. Mlekush, WICR, NPS

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## Introduction

Bloody Hill is an area at Wilson's Creek National Battlefield which saw major battle during the civil war in 1861, it also includes the historically important glade where much of the battle happened. On Bloody Hill, prairie grasses are prominent and along with a mixture of prairie forbs, interspersed with trees and shrubs, create a savanna-like appearance. Chinquapin oaks (*Quercus muhlenbergii* Engelm.) occur primarily on calcareous cliffs, glades and upland woods (Steyermark, 1972). The Chinquapin oak is a climax tree on dry soils, particularly of limestone origin (Nelson, 1987). It is moderately shade tolerant when young, but becomes increasingly intolerant of shade with age. In the open, trees usually develop a short trunk and broad crown (Tirmenstein, 1991). Individual trees of this species typically occupy the dominant or co-dominant layers in the overstory canopy. This study sets out to characterize the current condition of Chinquapin oaks across Bloody Hill.

## Methods

The Bloody Hill survey area consists of 13.57 ha (Fig.1) This area was divided into 603 cells, each measuring 15m x 15m, in order to systematically survey the entire area. Bloody Hill was surveyed during the fall and winter of 2009 into 2010.

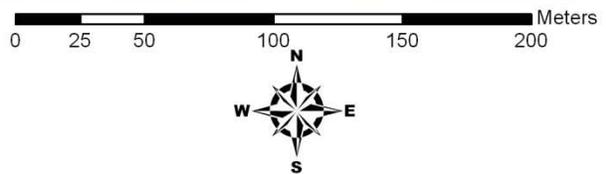
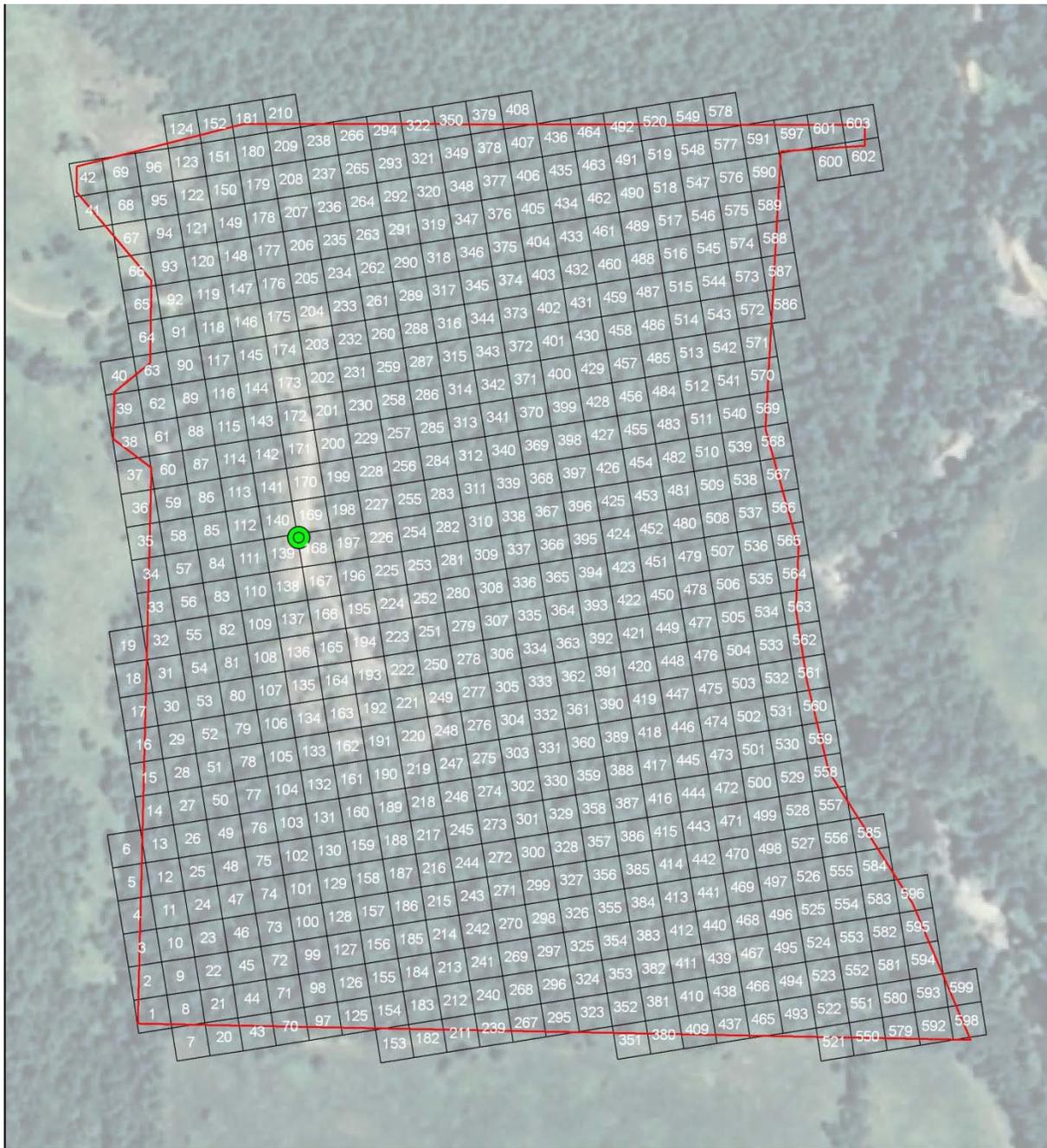
For trees < 30 cm diameter at breast height (dbh) the number of individuals was tallied in 5 size classes (Table 1). Trees with a dbh of  $\geq 30$  were measured with a dbh tape, the actual measurement and exact location was recorded with a GPS unit. For reporting, trees  $\geq 30$  cm were assigned to three size class ranges (ie. classes 6-8, Table 1). Standing dead individuals were recorded similar to live trees. Each tree with a dbh of  $\geq 30$  cm was assigned a live tree crown position code (Table 2). All trees regardless of their size were marked with pink flagging to avoid duplication.

**Table 1.** Diameter at breast height (dbh, cm) size class ranges for overstory trees.

Size class	dbh (cm)
1	5.0 - 10.0
2	10.1 - 15.0
3	15.1 - 20.0
4	20.1 - 25.0
5	25.1 - 29.9
6	30.0 - 50.0
7	50.1 - 70.0
8	$\geq 70.1$

**Table 2.** Description of live tree crown position codes (Fire Monitoring Handbook 2003).

Code	Position	Description
1	Dominant	Trees with crowns extending above the general level of the crown cover and receiving full light from above and at least partly from the side; these trees are larger than the average trees in the stand and have well developed crowns, but maybe somewhat crowded on the sides.
2	Co-dominant	Trees with crowns forming the general level of the crown cover and receiving full light from above, but comparatively little from the sides; these trees usually have medium-size crowns and are more or less crowded on the sides.
3	Intermediate	Trees shorter than those in the preceding classes, but with crowns either below or extending into the crown cover formed by co-dominant and dominant trees, receiving little direct light from above and none from the sides; these trees usually have small crowns and are considerably crowded on the sides.
4	Subcanopy	Trees with crowns below the general level of the crown cover and receiving no direct light from above or from the sides.
5	Open growth/Isolated	Trees receiving full sunlight from above and all sides. Typically, these are single trees of the same general height and size as other trees in the area, but where the stand is open and trees are widely separated so dominance is difficult to determine.



**Figure 1.** Map of tree search area on Bloody Hill

## Results

A total of 839 trees were counted on the entire grid, of those, 122 trees with a dbh of  $\geq 30$  cm (size class 6 and greater) were recorded along with 717 trees being tallied across the 5 smaller size classes. Standing dead trees were included in the count. Size class 1 had the highest density of live Chinquapin oaks and the highest density of dead trees (Table 3).

**Table 3.** Density (stems/ha) of live Chinquapin oak (QUMU) and standing dead Chinquapin oak (QUMU-snag) in 8 size classes.

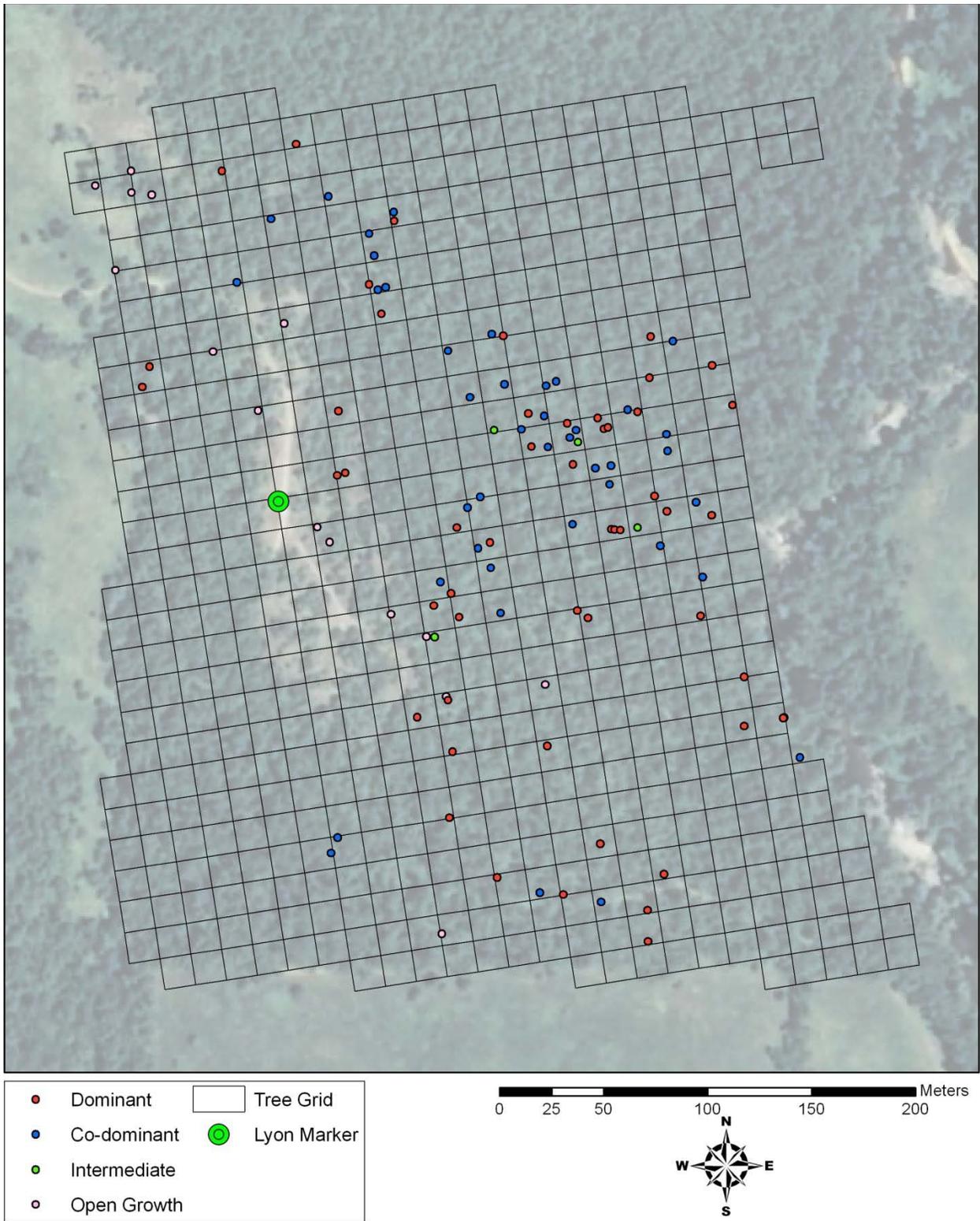
Species	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8
QUMU	23.4	17.4	6.1	2.5	1.4	5.5	2.2	0.5
QUMU-snag	1.3	0.4	0.1	0.2	0.2	0.7	0	0

Basal area for Chinquapin oaks was the highest in size class 6 and basal area for standing dead trees was the highest in size class 6 (Table 4).

**Table 4.** Basal area ( $m^2/ha$ ) of Chinquapin oaks (Live) and standing dead trees (Snag) in 3 size classes.

QUMU	SC6	SC7	SC8
Live	8.8	7.7	3.7
Snag	1.2	0	0

Of the 112 live Chinquapin oaks, dbh  $\geq 30$  cm, 51 % occupied a dominant position, while 38 % were co-dominant. Tree crowns in the intermediate position accounted for 4 % and open growth for 15 % (Fig. 2).



**Figure 2.** Location and live tree crown position code (CPC) for Chinquapin oaks.

## Summary

The Chinquapin oak survey on Bloody Hill was conducted to assist the park with resource management and preservation of a historically important site. Of the 839 trees recorded, the highest number of live trees was in size class 1 and the highest number of standing dead trees was in size class 1. The survey provides resource management with base line information on the current status of the Chinquapin oaks on Bloody Hill. Future surveys can provide information on changes in density, basal area and tree crown positions over time.

## Literature Cited

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