Shortleaf pine restoration on the southern Cumberland Plateau

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The University of the South
Sewanee, TN

Thanks!

National Fish and Wildlife Foundation

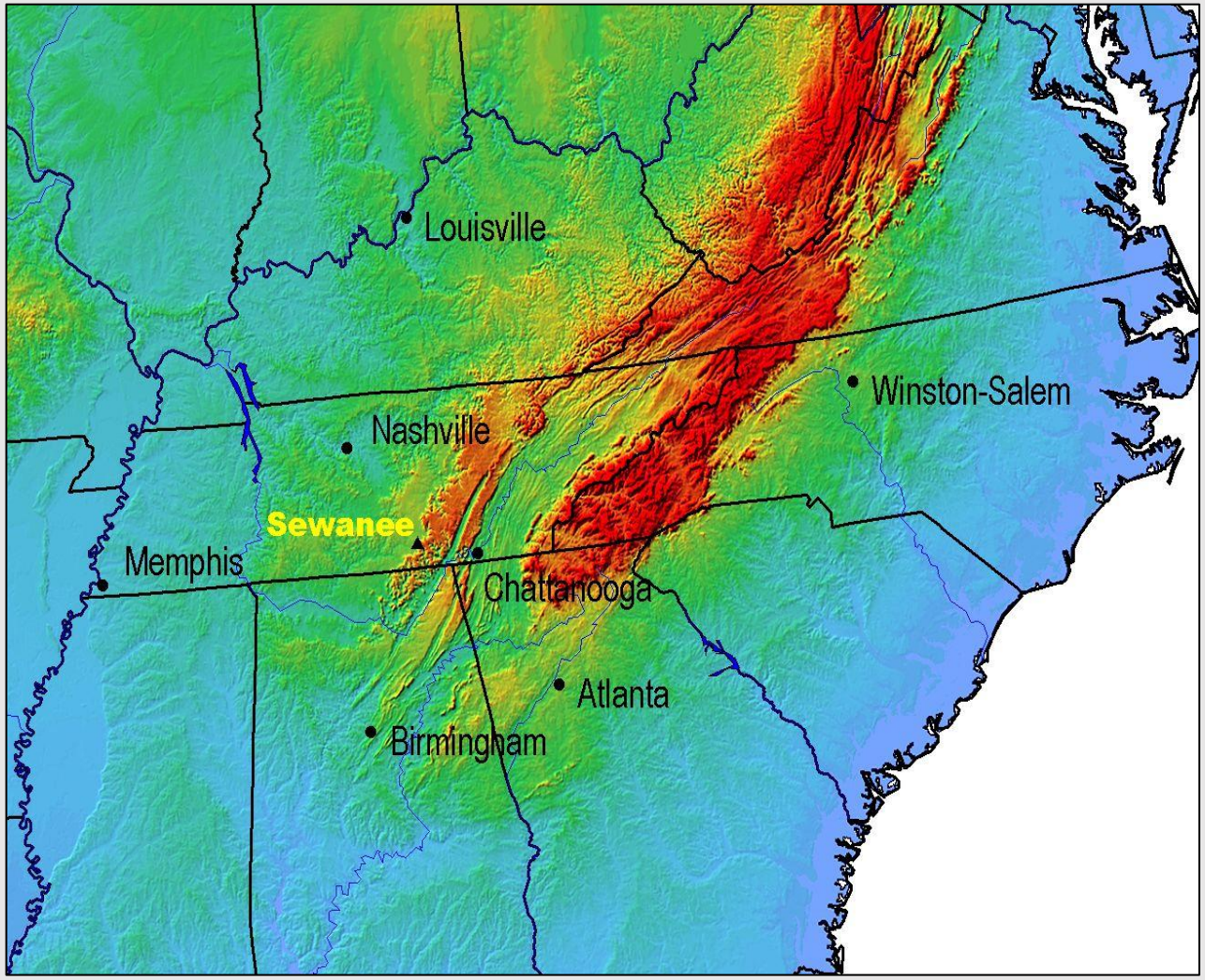
Shortleaf Pine Initiative (especially Mike Black and Clarence Coffey)

Partners – Forest Stewards Guild, Tennessee Wildlife Federation, Berea College

Tennessee Division of Forestry

Sewanee's Office of Environmental Stewardship Sustainability

Students in FORS 262 – Forest and Watershed Restoration


Louisville
Winston-Salem
Nashville
Sewanee
Memphis
Chattanooga
Atlanta
Birmingham


sewanee map
Legend
Google Earth
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On top of plateau (1850-2000 feet elevation)

Undulating surface with sandstone derived soils 1-4 feet deep, mainly Ultisols

10-15 tree species per acre, hardwood dominated

Many stands high graded, overstory 80-120 years dominated by oak

Native pine = shortleaf and Virginia

Understory dominated by *Smilax*, *Vaccinium*, tree seedlings

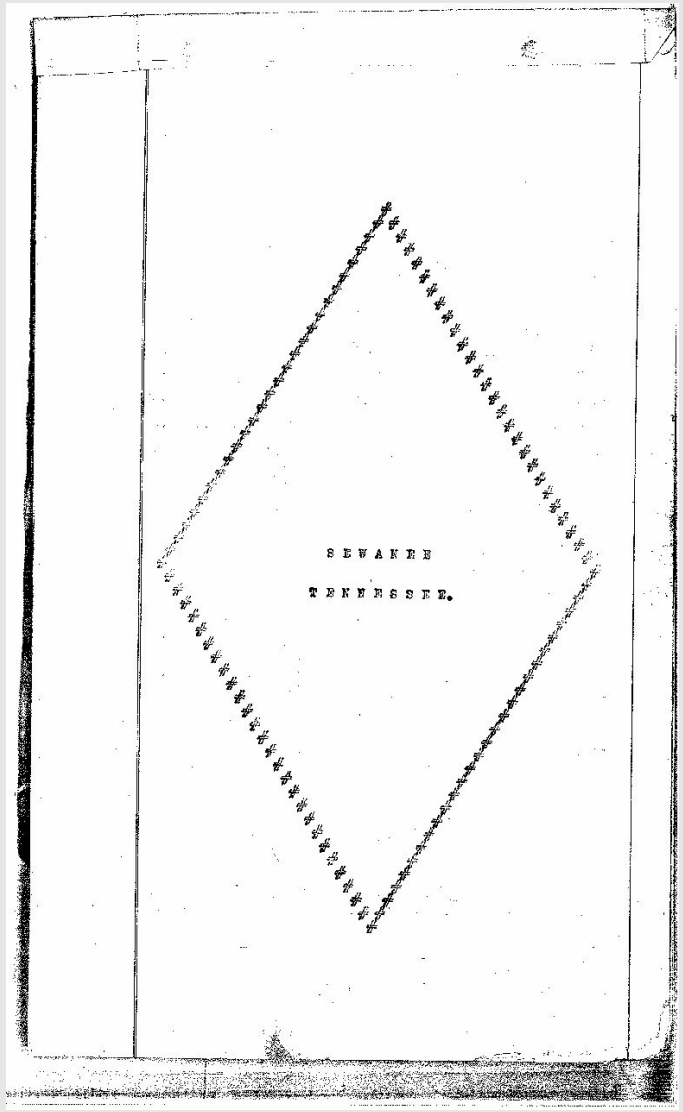
American chestnut once common

South and west facing slopes – dry limestone benches with hickory, oak, ash, walnut, eastern red cedar, sugar maple, some grassy glades, vines common

North and east facing slopes – mixed deciduous forest, 15-25 species per acre, increasingly see a lot of sugar maple saplings, vines common

Putting fire back on the landscape

First management plan in 1899 by Carl Schenck (The Facts at Hand), the second in 1903 by John Foley (Conservative Lumbering at Sewanee)



U. S. DEPARTMENT OF AGRICULTURE.
BUREAU OF FORESTRY—BULLETIN No. 39.
GIFFORD PINCHOT, Forester.

CONSERVATIVE LUMBERING

AT

SEWANEE, TENNESSEE,

BY

JOHN FOLEY,
FIELD ASSISTANT, BUREAU OF FORESTRY.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1903.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF FORESTRY,
WASHINGTON, D. C.

November 29, 1899.

Mr. B. L. Wiggins,
Vice-Chancellor, The University of the South,
Sewanee, Tennessee.

Dear Mr. Wiggins:

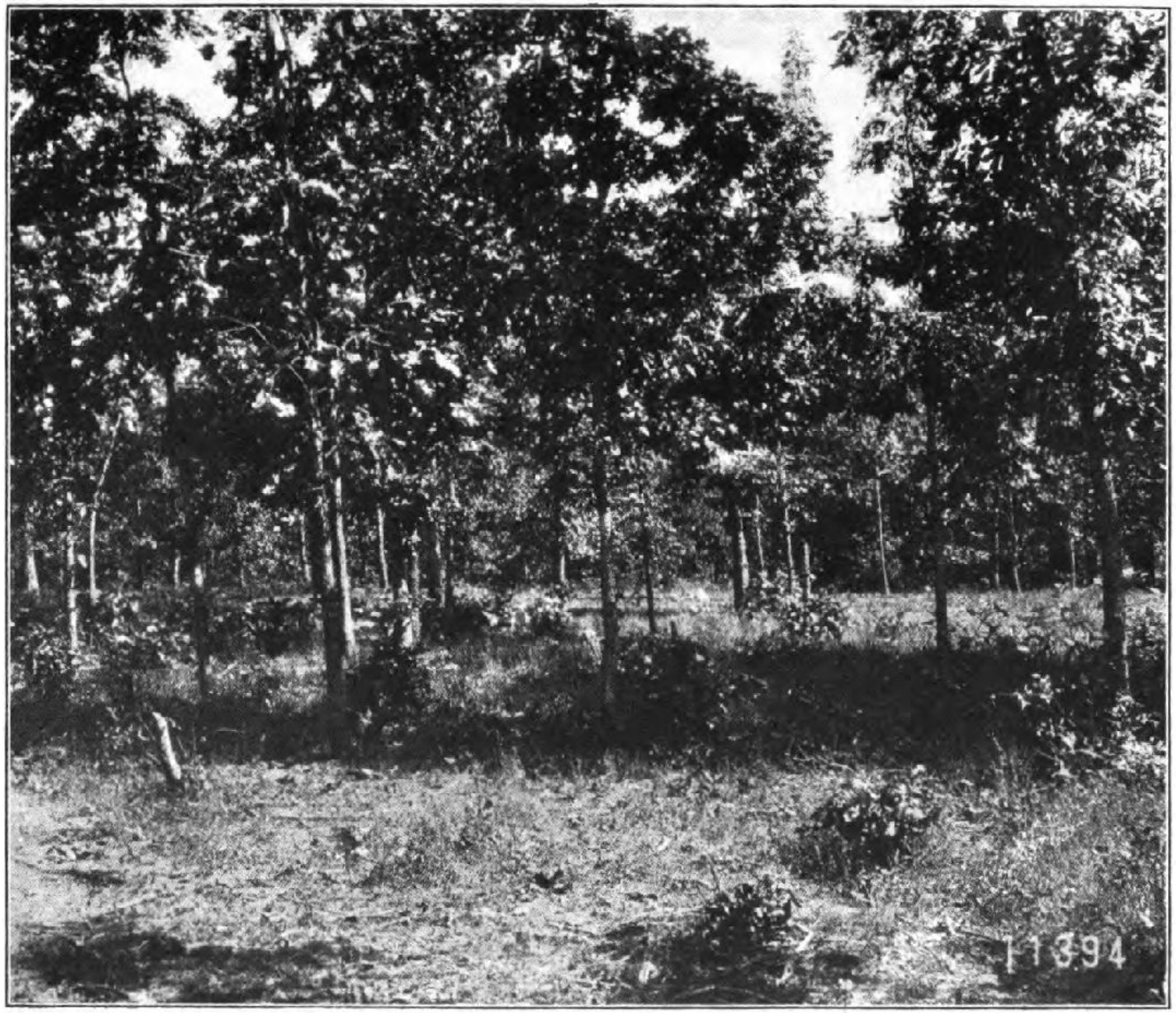
Upon my return from a few days absence, I find your kind note of the 25th inst. Tonight I shall set to work on the Sewanee working plan and hope to send it to you almost at once. Dr. Schenck will, I think, be able to begin marking in the immediate future. I am ashamed to say that I neglected to notify him as I said I would do, the matter having been crowded out of my mind by an unusual pressure of work just before I was going away. I am telegraphing him this morning and following the message up with a letter.

Very sincerely yours,

Gifford Pinchot

Forester.

You may be sure I shall
do my best to help them.


11394

fires, would also exist upon the plateau.

CAUSES OF FIRE.

Most fires at Sewanee occur in the early spring and late fall. They are usually set by railroad locomotives, farmers, nut-gatherers, or visitors to the woods. The railroad is responsible for some fires, but not for as many as are laid at its door. It is, for example, often charged with setting fires which had their origin on the windward side of the track, far beyond the reach of sparks. Farmers burn off the leaves and underbrush to improve the pasturage; nut-gatherers set the leaves afire in the fall to expose the nuts and crack the husks; and visitors, thoughtless or careless of consequences, drop lighted matches or burning tobacco in the forest.

EFFECTS OF FIRE ON THE TREES.

The susceptibility of the trees to fire depends largely upon the protection their bark affords them. The bark of Tulip-tree, White Ash, Cucumber-tree, and White Basswood is thick, but it burns through very rapidly; while that of hickory, although much thinner, is hard to ignite, and affords a better protection. The oaks, especially Scarlet Oak, are protected by an excellent fire-resisting bark, thick and corky. Young trees, because their bark is thinner and their crowns nearer the ground, are more easily injured than old trees; and seedlings a year old will die altogether if their leaves are burned away, although in their second year and afterwards their roots will sprout. The season in which the fire occurs, and the health of the tree, are factors which have much to do with the damage done the forest by burning. A tree burned in the spring before the sap has begun to

Sewanee management history in a nutshell

Before 1840 – nine thousand years of human history (Yuchi, Cherokee, Creek, Shawnee, Choctaw, Chickasaw)

1840 – 1900, lots of unmanaged harvesting

1910-1980s, lots of managed harvesting, still some high grading

1980s- 2000, very little forest management

2001 – 2004, pine beetle harvests

2004 – present – hardwood management and restoration projects


2010 we started thinning and burning for oak regeneration.
Arguments ensued.

Smith et al. Fire Ecology (2020) 16:20
https://doi.org/10.1186/s42408-020-00080-2

Fire Ecology

ORIGINAL RESEARCH Open Access

The effects of oak (*Quercus*) restoration on forest trajectory and small mammal use in the southern Cumberland Plateau, USA

C. Ken Smith[1*], Amy J. Turner[2], J. Kevin Hiers[3], Julie Garai[4], W. Nate Wilson[2] and A. Nicole Nunley[1]

Abstract

Background: Thinning and prescribed fire are increasingly used to promote oak (*Quercus* L. spp.) regeneration in forest restoration projects across the eastern United States. In addition to monitoring the response of vegetation to these reductions in basal area, the research and land management community has become focused on the response of wildlife to these treatments. In a landscape in which forest ownership is fragmented and dominated by non-industrial private landowners, predicting the range of wildlife and vegetation response to treatments will be necessary to facilitate adoption of a landscape-scale approach to oak restoration. The goal of this study was to examine the efficacy of restoring privately owned, mixed forest stands that were partially planted in loblolly pine (*Pinus taeda* L.) and eastern white pine (*Pinus strobus* L.) to oak-dominated communities through the use of

Oak restoration results (2010 – 2018)

- oak seedling densities varied across our three burned and thinned upland sites but overall increased by 3000 seedlings per acre

- presence of mast producing white oak and chestnut oak important

- three fires over 7 years did a nice job keeping red maple and yellow poplar from dominating

- Our twelve bat species had higher activity in thinned and burned sites compared to adjacent unthinned and unburned forest

- We trapped similar numbers of rodents in managed and unmanaged forest

Shortleaf pine restoration

In 2016, we created 1-3 acre openings and planted bare root shortleaf pine at tight spacings. We have all these units on a burn schedule.

The management objective is to create small patches of shortleaf pine-hardwood woodlands with an open understory maintained by repeated fires.

Create a small matrix of these inside a hardwood dominated forest.

In 2017 -2020, with NFWF funding, our openings expand to 1 – 5 acres, we planted shortleaf plugs. Again, at very tight spacing (6 x 6).

The Forest Stewards Guild, Tennessee Wildlife Federation, and the University of the South invite you to

Restoring Woodland Health with Shortleaf Pine

Learn how to improve forest health and ecological value, with shortleaf pine and prescribed fire

Free presentations and tour:

Saturday April 14th, 2018
Forest of the Domain at Sewanee, TN
9:00am to 12:30pm

(Registration begins at 8:30am)

REGISTER TODAY

Details: forestguild.org/node/564
Inquiries: email nick@forestguild.org

Join us and bring a friend

for an overview of the ecology and economics of shortleaf pine along with information on the available financial and technical assistance to help you steward your woodland, enhance wildlife habitat, and improve value. Learn about shortleaf management practices such as:

- Prescribed burning
- Planting shortleaf pine
- Managing for wildlife
- Forest thinning

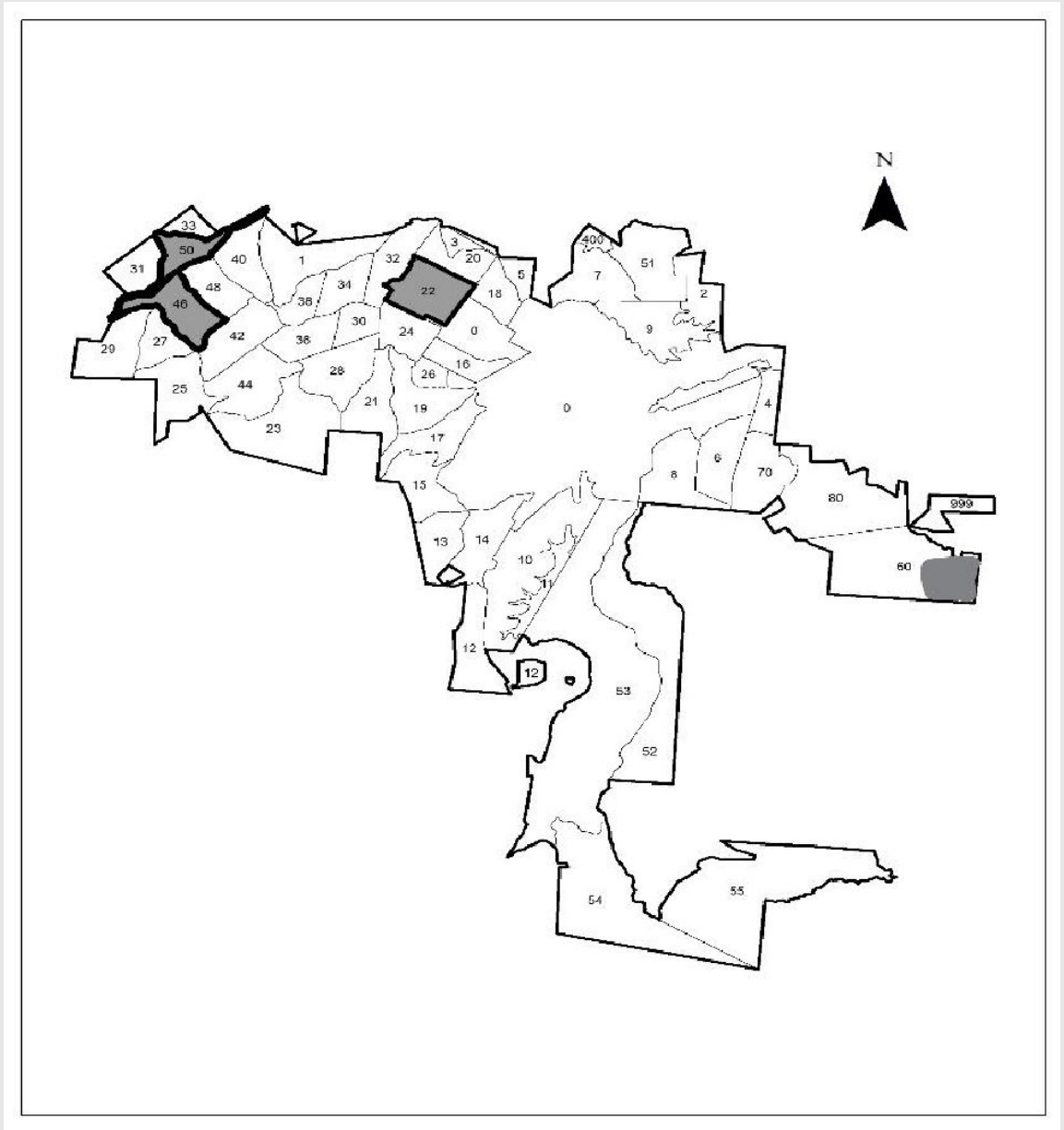
Forest Stewards Guild — putting the forest first

TWF — Tennessee Wildlife Federation

Sewanee — The University of the South

Berea College — God has made of one blood all peoples of the earth

Shortleaf restoration units across four of our management compartments



In each management compartment, multiple 1 – 5 acre openings of irregular shape

COMPARTMENT 50

Shortleaf monitoring

- Seedlings not graded before planting
- Bare root seedlings from 2016 and 2017 planted by volunteers
- Containerized seedlings from 2018 – 2020 planted by professional crews
- Fire applied 2 – 3 years after planting

Results

- Fire reduces number of shortleaf per acre; average height and diameter decreases vs unburned sites
- But…. 200 – 400 seedlings per acre still out there, still meeting our ecological objectives
- Most hardwood competition is sumac, sassafras, black locust, yellow poplar, red maple

Bare root seedlings planted in 2017, burned in 2020

From the literature

Goode et al. 2021 – Forest Science

“based on our findings, we recommend managers consider silvicultural systems that focus on patches”

Clabo and Clatterbuck 2019 – J. of Torrey Bot Soc

“Burning of artificially regenerated shortleaf pine seedlings should be delayed for at least 3 yrs after planting in the Cumberland Plateau and Mountains regions to reduce top-kill rates, growth losses, and mortality experienced by younger seedlings.”

We also are managing one 50 acre site with 115 year-old shortleaf for natural regeneration


Maintain shortleaf planted in the 1960s – maybe from Arkansas?
This was thinned in 2011 and has been burned three times.

Benefits of restoration program

Exposing students to management and fire.
Annual wildland and prescribed fire training attended by 25 - 45 students.

Upgrade in equipment

Monitoring bats and rodents as well as vegetation