UNDERSTANDING CLIMATE CHANGE RESILIENCY OF OKLAHOMA FORESTS USING FVS AND CONJOINT ANALYSIS

DEPARTMENT OF NATURAL RESOURCE ECOLOGY AND MANAGEMENT

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Abstract

The forest-grassland ecotone in the southcentral US is the tension zone between two major biomes and provides a number of important ecosystem services. Active management in the region using prescribed fire, forest thinning/harvesting, grazing, and herbicides can optimize desired benefits for landowners with a variety of management objectives. However, periodic severe droughts that plague this area and increasing climate variability have profoundly affected the productivity, resilience, and stability of ecosystems. We aim to facilitate sustainable management of the forest-grassland ecotone for different combinations of objectives such as timber, grazing, and wildlife habitat based on recent conditions and to adapt management to mitigate the negative effects of future drought and potential climate change. To this end, we are assessing the value of timber, cattle forage, and deer habitat. Input and output variables involved in valuation of timber, wildlife and cattle forage will be discussed. Tailoring research findings with the appropriate outreach materials will help educate traditional and non-traditional forest stewards in the region.

Introduction

Forest grass ecotone in the Southern US provides a number of important benefits such as timber, forage for livestock, and wildlife habitat. The productivity, resilience, and stability of ecosystems have been threatened by severe drought and precipitation.

Our research goal is to determine the effects of inter-annual variation in weather and drought on economic value of different mixes of ecosystem services related to timber, cattle grazing, and deer forage for different ecosystem types ranging from closed-canopy forest to open savanna.

Objectives

Quantify the economic benefit associated with the deer hunting in different ecosystem resulting from different combinations of management regimes.

Understand the economic benefit associated with wildlife habitat for gaming propose under recent climate condition and future scenario.

Method

Mailing survey to understand landowners' willingness to pay (WTP) for better deer hunting experience.

Best Worse Choice Modeling (BWC) where responders rank their preference of alternatives or chose the most and least preferred choice from alternatives (Hanley et al., 2001; Vossler et al., 2012).

It states that the satisfaction derived by the consumer from the goods can be disintegrated into satisfaction derived from the individual attributes of the product (Lancaster, 1966).

Forest Vegetation Simulator (FVS) to calculate timber growth.

The Net Present Value (NPV) and Equal Annual Equivalent (EAE) will be calculated using timber volume.

Table 1: Description of Treatments in Pushmataha Forest Habitat Research Area.

Treatment	Current Condition	Harvest Pine	Thin Hardwood	Fire Return Interval (Yrs)
Control	Forest	No	No	No Fire
HT	Forest	Yes	Yes	No Fire
RRB	Forest	No	No	4
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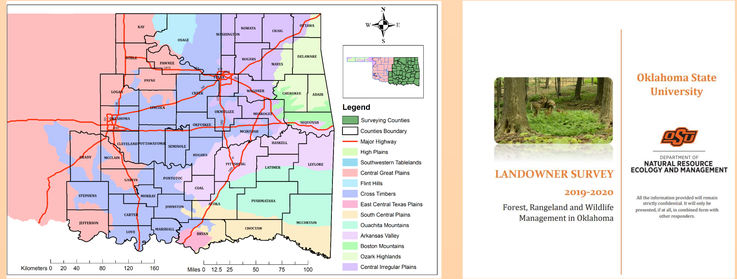

Figure 1: Counties selected to conduct survey for the research project (left) and survey cover page (Right).

Table 2: Characteristic attributes, levels for deer hunting sites and sample choice set developed for the survey.

Attributes	Levels
Deer Sanctuary and Food Plot	Sanctuary and Food Plot Sanctuary without Food Plots No Sanctuary No Food Plots
Deer Observed Per Visit (3 levels)	1, 6, 10
Canopy Condition (3 levels)	Closed Canopy Cover Moderate Canopy Cover Open Canopy Cover
Hunting Lease (3 Levels)	$6 /acres/year $10 /acres/year $16 /acres/year

Table 3: Example of choice set in Survey.

Best attribute of site (Check only one box)	Hunting site attributes	Worst attribute of site (Check only one box)
☐	Deer sanctuary with food plots	☐
☐	Close canopy forest	☐
☒	10 deer observed/visit	☐
☐	$16 hunting lease/acre/year	☒
Would you lease this hunting site?	**☒ Yes**	**☐ No**

Figure 2: Open canopy (top left), intermediate opening canopy (top right and closed canopy (bottom left) obtained from Pushmataha forest habitat research area, Oklahoma.

The various habitat types are maintained for more than 35 years using various treatments as given in Table 1.

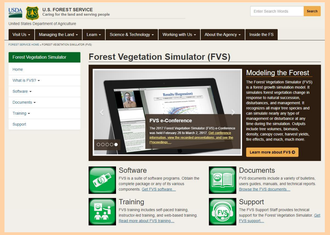

Figure 3: FVS Website Interface.

Forest Vegetation Simulator (FVS) an individual-tree, distance-independent, tree growth and yield model developed by US Forest Service.

FVS simulates response of vegetation in relation to succession, disturbances and various management activities and regimes (US Forest Service, 2020).

Preliminary Results:

- We expect to understand landowners' willingness to pay for active management to provide better deer hunting experience in Oklahoma.
- Landowners with higher economic status and longer hunting experiences are more willing to invest in the active management of ecosystem to provide better hunting experience.
- Landowners whose major objective is livestock production are less interested to invest in the active management of ecosystem for deer habitat management.
- Landowners willingness to pay reflects economic returns from different ecosystem. The variation in climatic condition impact the economic return from forest and savanna.

Acknowledgement

This research is supported by USDA NIFA Foundational Knowledge of Agricultural Production Systems 2017-06177

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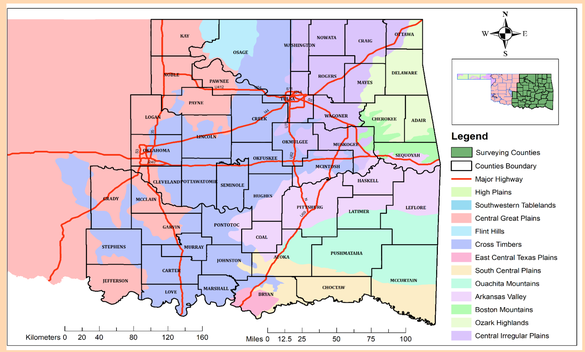

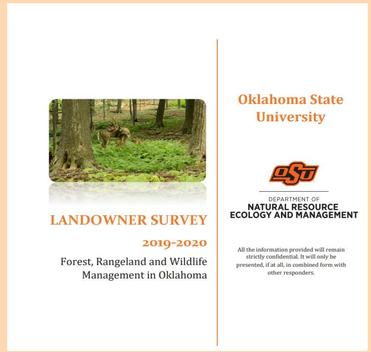

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