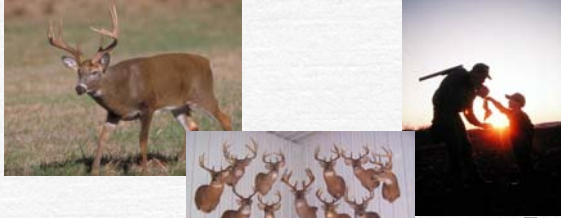Forestry, Wildlife and Fisheries Graduate Seminar

Demand for Wildlife Hunting in the Southeastern United States

Presented by: Neelam C. Poudyal
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4:40 PM
160 PBB

Introduction

- **Hunting has made significant social and economic contribution**
  - $ 20 billon in 2001; US Fish & Wildlife service, 2001)

- **Economic effect of hunting greater than some state's major crops**
  - Peanuts in Georgia (IAFWA, 2002)

- **Multiplier effects (equipment, transportation, accommodation, jobs etc.)**

Introduction…

- **Growing concern of decline in hunting license sales (Anderson et al 1985; Sun et al. 2005)**
- **20% decline in number of hunters nationwide in last two decades**
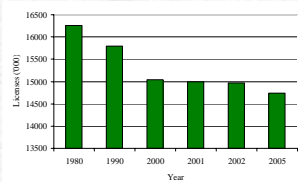- **15 million in 2002 to 14.7 million in 2003**

Fig: Certified hunting license sales in USA (US Fish & Wildlife Services)

Introduction…

Benefits from Hunting

- Revenue
  - License sales

- Species management
  - Game management tool

- Social benefit
  - Recreation
  - Friendship
  - Tradition

Introduction…

- **Decline in license sales implies:**
  - **Economic effect**
    - Less operating budget for agencies

  - **Ecological effect**
    - Overpopulation of animals

  - **Social effect**
    - Human-Wildlife Conflict
    - Crop depredation
    - Highway collision

Introduction…

- **Number of studies scrutinized demand for wildlife hunting**
  - (Ziemer et al. 1980; Miller and Hay,1981; Anderson et al., 1985; Brown and Connelly, 1994; Teisl et al., 1999; Mehmood et al., 2003; Sun et al., 2005).

- **Essential to understand what influences hunting demand.**

- **Projecting how the future of wildlife hunting will like has not been a focus of previous studies.**

Objectives

- To develop an economic demand model for the wildlife hunting

- To determine what affects the demand for wildlife hunting in the southeastern United States

- To project the demand for wildlife hunting in the region for next few decades

Empirical Model

- Following Sun et al. (2005); Anderson et al (1985), a log-linear demand model was used

$$\ln Y = \beta_0 + \sum_k \beta_k X + \varepsilon$$

Where,
ln Y is a N by 1 vector of the natural logarithm of the number of licenses sold in counties .

X is a N by K matrix of the explanatory variables

ε is N by 1 vector of independent and identically distributed random errors

Empirical Model

- Heteroscedasticity
  - White test of homoscedasticity was rejected (Chi-Square value= 416. 11, df = 169, p < 0.0001)
  - FGLS estimation (Greene, 2002)

$$\hat{\beta} = (X \hat{\Omega}^{-1} X)^{-1} X \hat{\Omega}^{-1} y$$

   where, the term Ω is an N by N diagonal matrix of error term

- Multicollinearity
  - Cut off point (10) $\text{VIF}_k = 1/(1 - R_k^2)$

Study Area

- Southeastern United States:
  - Hunting is the major consumptive outdoor recreation (Lamar and Donnell, 1987)
  - Fastest growing region in terms of population growth and urbanization (Reynolds, 2001)

- Analysis units: 1066 counties from 10 states:
  - Alabama
  - Georgia
  - North Carolina
  - South Carolina
  - Tennessee
  - Virginia
  - Kentucky
  - Arkansas
  - Louisiana
  - Texas

Variables and Data Sources

Variables	Sources	Variables	Sources
Dependent			
Resident license sold	State Agencies		
Explanatory			
License fee	USFWS	Population	US Census
Personnel income	US Census	Commute time	US Census
Employment (%)	US Census	Public forest (%)	NORSIS
Low education (%)	US Census	Private forest (%)	NORSIS
College graduate (%)	US Census	Gun Club dummy	NORSIS
Age (16-34) %	US Census	Amusement	NORSIS
Age (35-65) %	US Census		
Single male Parent HH	US Census		
Caucasian (%)	US Census		

Empirical Results

Variables	Parameters		Variables	Parameters	
Intercept	-1.710	***			
Socioeconomic variables					
ln(License fee)	-0.204	*	ln(Population)	0.516	***
ln(Personal income)	0.312	***	Commute time	-0.011	***
Employment (%)	-0.014	***	Public forest (%)	0.019	***
Low education (%)	0.012	*	Private forest (%)	0.003	***
College graduate (%)	-0.037	***	Gun Club dummy	0.254	***
Age (16-34) %	-0.004		Amusement	0.008	
Age (35-65) %	0.019	**			
Single male Parent HH	-0.041	***	Adj. R Square	0.73	
Caucasian (%)	0.013	***	N	1066	

Demand Projection

- Simulate future hunting demand under a number of assumptions about explanatory variables
  - Demographic change
  - Forest land use change
  - Institutional changes
- Estimated regression parameters from the structural model are applied to the projected values of the explanatory variables
- Region's demand projection over five-year intervals from 2000-2030
- Simulation
  - Projected values
  - Interpolation/extrapolation
  - assumptions

Demand Projection

- The region will experience a slight decrease in hunting demand from 2000 to 2030 Demographic change
  - Demand in 2030 would be 5.36 million in the region, which is about 9% less than that of 2000
  - Bowker, English, & Cordell (1999) forecasted national hunting participation to decline by 11% from 1995 to 2050
- Expected decline in hunting demand can be attributed primarily to :
  - Structural change in demographics
  - Decrease in forestland in the area
- A significant change in demographic structures and loss of forest areas particularly those under private ownership
  - Browning
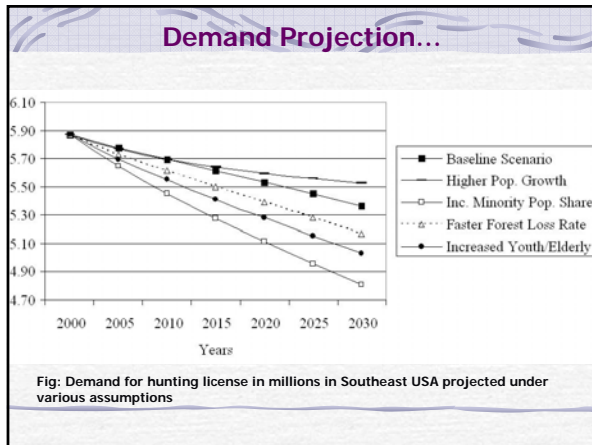 - Ageing
  - Forest land loss

Demand Projection…

- Alternative Scenarios ???
  - Increasing rate of population growth
  - Faster rate of Hispanic growth

  - Increasing urbanization and land use change

  - Decreasing access to forestlands

  - Increase in elderly and young population

Demand Projection...

Scenarios	2000	2005	2010	2015	2020	2025	2030
Base-line Alternative	5.87	5.77	5.70	5.62	5.53	5.45	5.36
Higher Population Growth	5.87	5.87	5.77	5.70	5.64	5.59	5.56
Incr. Minority Pop. Share	5.87	5.64	5.45	5.28	5.11	4.96	4.81
Faster Forest Loss Rate	5.87	5.73	5.61	5.50	5.39	5.28	5.17
Increased Youth & Elderly	5.87	5.70	5.55	5.41	5.28	5.16	5.03

- ☞ **Baseline**
  - ※ Best guess based on projected reports and literature
- ☞ **Higher Population Growth**
  - ※ Population growth rate that is 1.33 times the rate in the base-line
- ☞ **Incr. Minority Poop. Share**
  - ※ White population will be 56% by 2030 instead of 65% in base case
- ☞ **Faster Forest Loss Rate**
  - ※ Annual forest decline rate of 0.43% (SENRLI, 2006)
- ☞ **Increased Youth & Elderly**
  - ※ Population of age cohort 34 to 65 would grow by half the rate in base case

Demand Projection...

Fig: Demand for hunting license in millions in Southeast USA projected under various assumptions
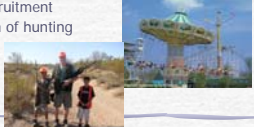
Conclusion

- ☞ Sociodemogrpahic data aggregated at county level can be combined with landuse information to explain demand for wildlife hunting.

- ☞ Demand for hunting license in the southeast is likely to decline by 9% through 2030.

- ☞ Most important factors appear to be structural shifts in population, particularly non-whites and an age shift.

Conclusion

- Age and race cohorts most positively correlated with hunting participation are declining
  - Hunting is not popular among youths

- Devise some program and marketing campaign to promote awareness and encourage both younger and non-white participation
  - Make hunting an equally desirable recreation among youth
  - Promote young hunter recruitment
  - Help preserve the tradition of hunting

Conclusion

- Demand for hunting is price *inelastic* among southeastern hunting
  - In increase in price induces a less than proportionate decline in sales and most importantly, an increase in revenue
  - Decreasing license fee will only increase participation by a less than proportional amount

- Availability of public hunting land has a far greater impact on license sales than private land
  - Agencies may consider programs which increase public hunting land.

- While the projection gives a general picture for the region, state agencies might find the model useful to project the region specific hunting demand and forecast revenue

- The model can be extended to understand and project demand for other consumptive outdoor activities such as fishing

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Thank you

Questions, Comments

(Photo:www.pheasantcrest.com)