

BRIEF REPORT

Crop Management

Growers, consultants, and county agents perceive white-tailed deer to be the most economically impactful pest of Georgia cotton

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Plain Language Summary

White-tailed deer damage is a common occurrence for cotton producers in the Southeastern United States, but in 2023, deer feeding on cotton and other crops was abnormally high. To determine how bad the perceived white-tailed deer problem is in cotton, producers, county extension agents, and crop consultants were surveyed. Growers, county agents, and consultants agree that white-tailed deer are an economic pest of cotton. The same groups reported that 33% to 41% of acres are affected by deer annually, while 34% to 42% yield loss is observed on affected acres. Additionally, \$51 to \$73 per acre are spent on mitigation measures according to growers, county agents, and consultants in an attempt to reduce deer damage. According to these answers, all three groups perceive white-tailed deer to be the biggest pest of cotton compared to other common, problematic pests. This paper is the first to demonstrate the severity of this issue in cotton and serves as a starting point for research on deer damage in cotton.

White-tailed deer (*Odocoileus virginianus* Zimmerman) are the predominant big game species pursued by hunters in North America. However, in the early 1900s, white-tailed deer were nearly hunted to extinction. Some of the earliest available data indicate that white-tailed deer populations ranged from 0 to 0.35 mi⁻² in 1950 in the Southeastern United States (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia), where populations had increased to 1.9 to 5.5 white-tailed deer mi⁻² in 2001 to 2005 in the same area (Hanberry & Hanberry, 2020). A major goal in the wildlife profession has been increasing wildlife populations, which has been achieved (Conover et al., 2018; Hanberry & Hanberry, 2020). However, this can create issues for agricultural producers, with

wildlife populations increasing to levels that have resulted in significant damage to crops (Conover et al., 2018).

Upland cotton (*Gossypium hirsutum* L.), on average, is planted on 11.7 million acres across the United States (USDA-NASS, 2024). In the same 10-year span, Georgia consistently ranked second in cotton acreage, with approximately 1.2 million planted acres annually, which makes it the most widely planted row crop in Georgia (USDA-NASS, 2024). Growers and extension personnel alike noted that deer damage to cotton was uniquely high in the 2023 growing season, particularly in southeastern states (Bain, 2023; Gratas, 2023). Reports in the literature of perceived impact of white-tailed deer on crop production are limited. Thus, a survey was distributed from September 2023 to March 2024 in Georgia

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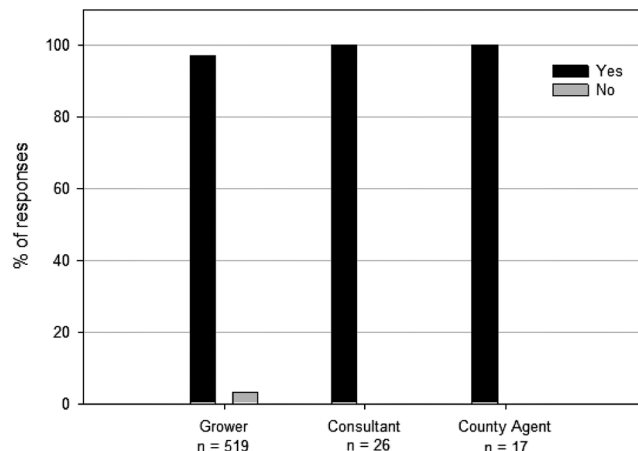
TABLE 1 Grower responses to survey by county and total acreage represented.

County/counties	Grower responses (no.)	Land represented in survey responses (acres)
Appling	6	2725
Baker	8	6500
Bartow/Gordon/ Floyd/Chattooga	11	7730
Berrien	6	2075
Bleckley	13	4585
Brooks	18	16,830
Bulloch	27	27,800
Burke	17	18,100
Calhoun/Randolph	11	11,200
Candler/Evans	9	3465
Coffee/Atkinson	24	26,600
Colquitt	13	9650
Cook	9	6042
Crisp/Dooly	23	37,125
Decatur	4	4550
Dodge	14	14,025
Early	11	3685
Emanuel	14	9000
Grady	14	5825
Houston/Macon/ Peach/Taylor	13	20,000
Irwin/Ben Hill	11	3960
Jeff Davis	4	3350
Jenkins	24	14,290
Laurens	12	4637
Lowndes	3	1087
Miller	13	7450
Mitchell	13	14,085
Morgan/Oconee	7	2250
Pierce	8	7850
Pulaski	15	18,800
Screven	14	11,775
Seminole	3	2250
Sumter	12	15,550
Tattnall	8	3235
Telfair	8	12,750
Terrell	10	16,775
Thomas	8	4175
Tift	10	4490
Toombs/Montgomery/ Treutlen	11	10,100
Turner	10	4490
Washington/Jefferson	14	11,035

(Continues)

TABLE 1 (Continued)

County/counties	Grower responses (no.)	Land represented in survey responses (acres)
Wayne	2	525
Webster	5	3800
Wilcox	19	17,300
Worth	16	16,300
Total	525	449,821

**FIGURE 1** Grower, consultant, and county agent responses to the question, "Are white-tailed deer an economic problem in cotton?"

to determine the perceived impact of white-tailed deer on cotton.

This survey was distributed to growers, University of Georgia County Extension Agents, and crop consultants, and they were asked about the following information: i) if deer are an economic problem in cotton; ii) annual cotton acreage (used to calculate acres represented in responses); iii) percent of cotton acres affected by deer; iv) percent yield loss observed on affected acres; v) dollars spent per affected acre on mitigation measures for deer damage on cotton; and vi) mitigation measures utilized (growers only). In total, 525 growers at 47 grower meetings responded representing approximately 449,821 acres (Table 1), 27 consultants responded representing approximately 352,625 acres, and 16 University of Georgia County Agents responded representing approximately 259,000 acres. Where appropriate, responses were compared to determine if perception was similar across groups utilizing two-tailed *t*-tests assuming equal variances, graphs were built, and standard errors were calculated using Sigmaplot 15.0 (Systat Software). Proportion data were analyzed using a beta distribution.

With respect to the first question, growers (96.9%), county agents (100%), and consultants (100%) agree that white-tailed deer are an economic problem in cotton (Figure 1). With

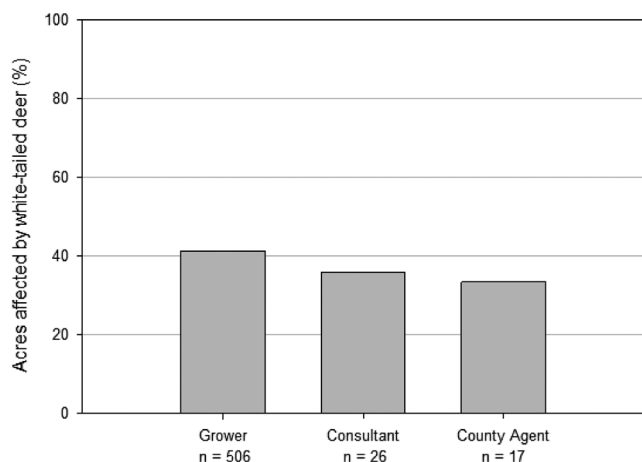


FIGURE 2 Grower, consultant, and county agent responses to the question, “What percent of your cotton acres/the cotton acres you service are affected by deer each growing season?”

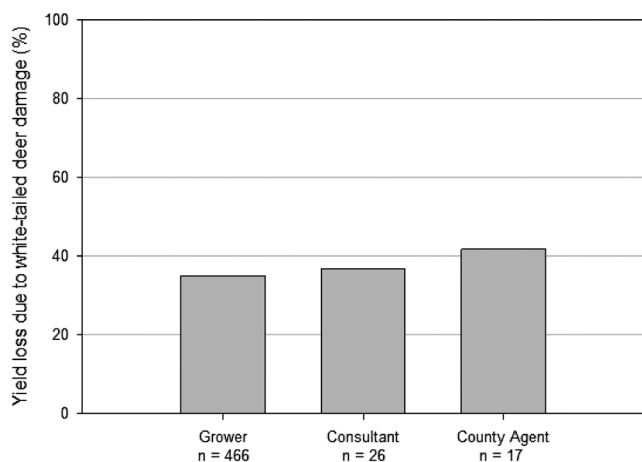


FIGURE 3 Grower, consultant, and county agent responses to the question, “What is the percent yield loss observed per affected acre of cotton with respect to deer damage?”

respect to perceived cotton acres affected by white-tailed deer, growers reported just over 41% of their acres were affected by white-tailed deer, consultants reported 35.7%, and county agents reported 33.2% (Figure 2). On affected acres, growers, consultants, and county agents reported 34.8%, 36.6%, and 41.5% yield loss, respectively (Figure 3). On affected acres, it was estimated that \$51.77, \$53.88, and \$72.63 was spent per acre on mitigation measures to reduce deer damage in cotton according to growers, consultants, and county agents, respectively (Figure 4). For perceived acres affected, yield loss, and dollars per affected acre spent on deer mitigation practices, there were no significant differences among responses between groups surveyed ($P > 0.05$), demonstrating that growers, consultants, and county agents similarly perceive white-tailed deer as a pest of cotton.

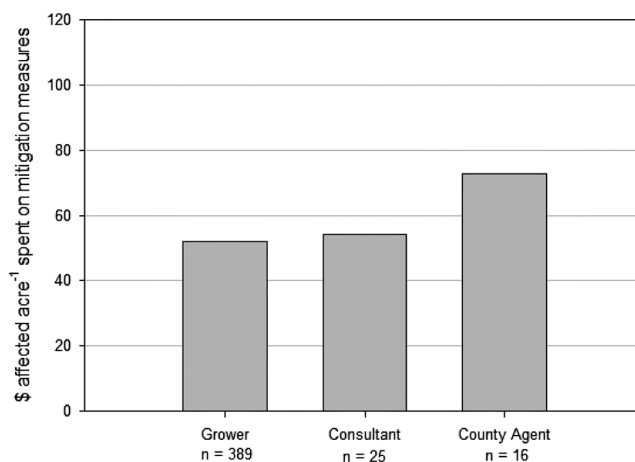


FIGURE 4 Grower, consultant, and county agent responses to the question, “How much is spent per acre on mitigation practices for deer damage on cotton (including replants, repellents, fencing, use of depredation permits including time and other expenses, etc.)?”

Of interest is how white-tailed deer compare as a pest to other problematic pests. To determine the most economically important pest of cotton, University of Georgia scientists were surveyed for key pests in weed science, plant pathology, and entomology. These economically important pests were Palmer amaranth (*Amaranthus palmeri* S. Wats), root-knot nematodes (*Meloidogyne incognita* Kofoid & White), and the stink bug complex [*Nezara viridula* (L.) and *Euschistus servus* (Say)]. For each pest, information was collected on the acres affected, yield losses, and dollars acre⁻¹ spent on control measures. Using 2023 planted acreage, average yield in Georgia, and average cotton price (1,110,000 acres, 982 lbs acre⁻¹, and \$0.83 lb⁻¹, respectively), it was determined that these three pests, from most problematic to least with respect to impact on Georgia cotton production are Palmer amaranth (\$104,650,800), root-knot nematodes (\$81,901,350), and stink bugs (\$58,521,420). Significant investments have been made to develop management programs for each of these pests that are effective when implemented in a timely manner. When the data from the perceived impact of white-tailed deer are extrapolated in this way [(yield loss per acre + management costs per affected acre) × affected acres], it demonstrates that growers (\$152,645,492), consultants (\$139,563,108), and county agents (\$151,417,461) believe that white-tailed deer are the most significant pest of Georgia cotton.

With respect to mitigation measures, the majority of growers stated they had used Department of Natural Resources depredation permits (70.6%), replanted cotton (64.2%), or applied repellents (52.1%) to reduce or in response to white-tailed deer damage (Figure 5). Fewer growers indicated they had used fencing to reduce deer damage (11.7%), or indicated they did something not listed (14.4%) which included

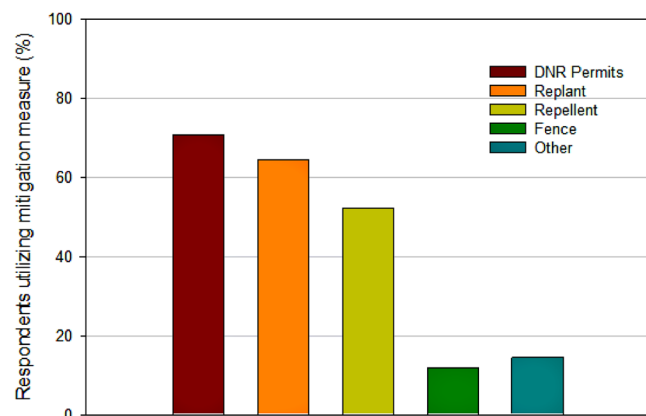


FIGURE 5 Grower responses ($n = 519$) to the question, “What mitigation practices do you utilize to reduce deer damage in your cotton crop? Check all that apply: DNR Depredation Permits, Replants, Repellents, Fencing, and Other.”

responses such as the use of artificial noise makers and scarecrows.

The results from this survey indicate that growers, consultants, and county agents view white-tailed deer as the most significant pest of cotton in Georgia. Additionally, this survey serves as a starting point for white-tailed deer research in cotton in Georgia. Future research will evaluate legitimate yield losses from white-tailed deer in grower fields, the effectiveness of mitigation measures and how often to use them (particularly repellents), the impacts of deer feeding on cotton growth and maturity, and numerous other objectives. These data can also assist in informing stakeholders, policymakers, and others on the perceived impact of white-tailed deer on cotton, potentially leading to increased funds for grower assistance and research on this topic.

AUTHOR CONTRIBUTIONS

Lavesta C. Hand: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing—original draft; writing—review and editing. **Phillip M. Roberts:** Conceptualization; data curation; investigation; methodology; writing—review and editing. **Sally Taylor:** Conceptualization; methodology; writing—review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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