Integrated Deer Management—— When does the risk justify the expense?

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In the past, Fraser fir growers in North Carolina used to associate the cost of managing deer with the price of a new box of ammunition and the loss of a few lower-quality trees that were horned along the edge of their woods. Unfortunately, deer have become much more costly both in the damage that they inflict and the expense of reducing their impact.

As the face of many rural areas change, hunting is seldom successful as a stand-alone strategy. Landownership is too fragmented, hunting regulations are too limited, and expanding deer populations range over too large an area for hunting to keep damage at tolerable levels. Deer control strategies that seemed too expensive several years ago may be justified under higher levels of deer pressure. In this article, I hope to lead you through a mental exercise of assessing damage and evaluating a cost effective control strategy.

Currently, Fraser fir farms in Ashe and Alleghany Counties in North Carolina and counties in Southwest Virginia are experiencing the greatest damage from deer, but some damage has occurred in other areas as well. Deer browsing on the tops and branches of young trees is the most destructive and widespread form of damage. Damage can range from slight disfigurement with the loss of several of branch tips to complete stripping of all foliage from the stem. Browsing is often greatest on the youngest trees but can continue until trees are 3 or 4 feet tall. Several newly planted fields in Ashe and Alleghany Counties have been reduced to a complete loss from deer browsing. Horning is more of a problem of mature trees and seldom is widespread across a field.

With impacts ranging from minor quality to major cull defects and mortality, it can be difficult to put a value on deer damage. The intensity of damage will vary with deer travel patterns, the age of the trees, and the number of times they have been browsed. If a year-old transplant needs to be replaced in the field, the cost of damage can be equated with the cost of replanting the space and an added year of production costs for that tree. As long as trees are reset into gaps created by deer damage, cost can be measured by the cost of rehabilitation.

Once a field of Christmas trees matures to the point where gaps and culls remain until harvest, then damage can be more reasonably measured by both increased costs of production and the loss in market value. However, when an older tree is damaged but not killed, costs are hard to assess. It takes longer to bring a damaged tree to market. Salvage shearing may be required for one or several years. The field of damaged trees may never achieve full potential and may go to market with a higher-than-normal percentage of cull and number two trees. On top of all of these cost factors, damage and recovery is different from tree to tree. Determining "average" deer damage is difficult to say the least.

Table 1. illustrates potential costs associated with several scenarios of deer damage. The first three scenarios simply reflect an increasing number of trees damaged or killed by browsing during the first year in the field: one where costs are too low to justify treatment, one that may, and one that clearly does justify treatment. The 4th scenario addresses costs over 3 years and is perhaps the most realistic because damage seldom stops after one year. Farm managers must address a perennial problem not an annual one. The horning scenario was included as a contrast to browsing. While it may be a more localized problem, it is often a last straw, additional damage to larger trees that finally were recovering from earlier browsing damage. I did not include the worst-case scenario of a total loss, but some growers have had to face the decision of either investing in deer control measures or abandoning a Christmas tree farm. The no-damage scenario was included as a frame of reference for the gross value of one acre of Fraser fir Christmas trees.

Estimating losses is one side of the equation. Determining an appropri-

Table 1.

Scenario	Type of Damage	Number of Trees*	Cost Measures	Costs	Total Cost
1	browsing 1st year	100 dead / culls 100 damaged (6 %)	transplanting, added year, pruning	$150 $50** $15	($215)
2	browsing 1st year	200 dead / culls 200 damaged (12 %)	transplanting, added year, pruning	$300 $100 $30	($430)
3	browsing 1st year	500 dead / culls 500 damaged (60 %)	transplanting, added year, pruning	$750 $250 $75	($1,075)
4	cumulative browsing after 3rd year	400 damaged, 50 % severely damaged (23%)	pruning, added year, 100 #2's 50 culls	$200 $250 $500*** $1,000****	($1,950)
5	horning	50 severely damaged (3%)	25 #2's 25 culls	$125 $ 500	($625)
6	no deer damage	150 culls from other causes(6%)	1750 6-7's 100 culls	+ $35,000 $2,000	$33,000

* 1750 trees/acre at 5 X 5 spacing

** annual cost of production ($0.50/tree)

*** difference between a #1 and a #2 6-7' Fraser fir ($5)

**** lost sale price of a #1 reflected in the market value of a #1 6-7' Fraser fir ($20)

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ate cost-effective treatment is the other. In an Integrated Deer Management project in Ashe, Alleghany, and Watuaga Counties funded by the NCSU IPM Program, a number of different control practices have been evaluated. The primary focus is on several repellants and a temporary fencing system, but some scare devices and the use of food plots to direct deer away from trees are also being evaluated. Dozens of products are available.

The least risky practice for deer control is 10-foot-tall permanent fencing (such as chain link fencing), but cost is prohibitive. Temporary slanted electric fences provide a cheaper alternative that is very easy to install but have the added risk that deer will possibly learn to cross them. Some growers have installed 10 foot tall plastic snow fences which could be permanent or possibly be moved to other fields of young trees. The snow fence requires a tree lined perimeter and/or fairly stout 12 foot tall poles. While either plastic fencing product claims a 10-year life span, neither has yet been tested for a full 10 years under our conditions. If a fencing system lasts for several years and successfully keeps the deer out, it may be the most cost-effective control strategy.

Deer repellents are the most widely used deer control strategy in our region at this time. They have the advantage of a low cost per application, but the number of applications can add up over the years when compared to fencing. Repellents use different combinations of animal blood, rotten eggs, hot pepper, herbs, and/or predator urine. Some repellents need to be reapplied as often as every 2 weeks whereas others last 3-4 months. Product cost has generally required directed manual application rather than more indiscriminate broadcast application. Treating all perimeter and a portion of the interior trees is one strategy growers have used to reduce the cost of application. Many repellents work at first, but deer learn to ignore them over time. One goal of the integrated deer grant is to determine if growers can use more than one strategy to reinforce repellents and extend their effectiveness. As long as growers lease land or have access issues that preclude fencing, alternative strategies such as repellents will be needed.

The Internet and popular literature abound with other alternatives for deer control. Many rely on some kind of scare technique. There are air cannons, sonic devices (we hear it), ultrasonic devices (we can't hear it), inflatable balloons, and water sprays to list the most common categories. Many may work, but over such a limited area so as to be cost prohibitive. Most of the sonic and ultra-sonic devices have an effective radius of less than 20 feet. The target audience is the homeowners with a small backyard, not farmers. In independent studies, the deer have become accustomed to any of the scare devices over time. However, they could be used to temporarily divert deer patterns of movement, support repellents at key access points, or possibly support fencing at a problem area. Some devices might have a limited supporting role in an effective IPM approach. A healthy level of suspicion would be valuable when considering any new deer control strategy.

Each farmer has his or her own threshold for damage and a limit to the level of economic loss that they are willing to risk before doing something to avoid its happening. In integrated pest management, an economic threshold is the point at which damage caused by a pest begins to exceed the cost of controlling that pest. Only when this break-even point is reached can the added expense of any pest control strategy be justified. The economic threshold for a deer repellant would be that level of damage that exceeds the investment in materials, labor, and equipment depreciation for all applications of the product over a season.

For a longer lasting strategy such as deer fencing, costs could be spread over the life of the fence rather a single rotation. Cost estimates associated with some deer control strategies are listed in Table 2. Over the three-year use during a rotation, fencing installation costs are divided while annual expenses such as repellent application or fence maintenance are multiplied by the number of years. When the treatment costs from Table 2 are contrasted to the losses represented in Table 1, an economic threshold can be determined.

Armed with your own field inventories that assess deer damage and some quick calculations of the costs of the deer control strategies that you plan to implement, you can determine where treatment is justified on your farm and which approach is the most cost-effective. Keep in mind that either total extermination of surrounding herds (unlikely) or complete exclusion are the only ways to permanently eliminate deer damage from your farm. Tall permanent fencing provides the closest thing to a guarantee, but at a heavy price. Anything else is a trade-off that adds risk for a lower cost. Shorter fences, repellents, other devices all contain the risk that deer will learn to overcome them. As a manager of risk, it ultimately comes down to your personal threshold for damage and your perception of what is affordable.

Table 2. Costs per acre associated with some deer control practices

Control Strategy	Component	Component Cost	Total Cost	Over 3 Years
Plantskydd Repellent (applied 2 times)	material* labor	$180 / year $32 / year	$212 / year	$636
Big Game Repellent (applied 4 times)	material* labor			
Hinder Repellent (applied @ 2 weeks)	material* labor			
Gallager 2 slant fence (10 year life)	fencing** labor maintenance	$714 ($0.85/ft) $32 (installation) $48 (6 hours/yr)	$746 $48	$248 ($85/10 yr) $144
10" snow fence with 12' wooden posts (10 year life)	fencing** posts, etc. labor	$759 ($0.90/ft) $150 (25 posts) $128 (installation)	$1037 $24	$346 ($104/10yr) $72

* 1750 trees per acre are treated with a backpack sprayer application to the terminal and top whorl.

** An 840 foot perimeter fence is put up around 1 acre of trees.