



Extension Research Note - RNS3

The following publication was printed in the 1996 Profitable Agriculture and a Clean Environment (PACE) Update published by the College of Agriculture and Natural Resources Cooperative Extension Service. It has been reedited to be put on the internet.

Use of Baited Polywire/Polytape (BPP) Fencing to Protect Forest Plantations

University Cooperators: Jonathan S. Kays*

Landowner Cooperator: Howard County Land Conservancy, Point Pleasant Farm, Howard County, Maryland; Washington Suburban Sanitary Commission (WSSC), Howard County, Maryland; Tom Niblock, Landowner, Frederick County, Maryland

Introduction

The use of baited polywire/polytape (BPP) fencing to protect field and row crops, home gardens, orchards, forest plantations, and other small acreage areas up to three acres and sometimes larger has been demonstrated by a number of PACE studies (1994 & 1995 PACE Updates) and more controlled research studies published in the Eastern Wildlife Damage Control Proceedings, Great Plains Wildlife Damage Control Proceedings, Wildlife Society Bulletin, and other professional publications. There is relatively little information on effectiveness, cost, and problems with using this type of fencing to protect large acreage forest plantations in Maryland or elsewhere. A paper presented on *Deer Protection for Small Forest Plantations: Comparing Costs of Tree Shelters, Electric Fencing and Repellents* (Kays, 1995), demonstrated the cost-effectiveness of BPP fencing when compared to other commonly used deer protection techniques, but urged the need for studies to determine factors that would control how much acreage can effectively be protected from deer.

Methods and Materials

This report summarizes three demonstration studies on forest plantations ranging in size from 3 to 15 acres in Frederick and Howard County. All sites are in areas with very heavy deer pressure.

The three sites described in this report either contained newly established plantations requiring protection or sites previously planted but unable to grow due to deer browsing. The specifics on each site are provided below.

Site 1 - Howard County Conservancy - A total of 24 acres on three areas (6, 8 & 10 acres) around a stream drainage (Figure 1) was planted in spring 1995. Seedlings of red cedar, red oak, white ash, black locust, and black cherry were saturated in deer repellent prior to planting. The fencing was installed immediately after planting.

Landscape evaluation: The 150-acre farm is under conservation easement and lies adjacent to Patapsco State Park with high deer populations. The purpose of the planting was to establish a large wooded riparian area around the existing stream drainage. The area around the farm is rapidly developing with a large development occurring across the main road from the farm. This loss of native deer habitat can be expected to increase the use of this area. The stream drainage through the planted areas is a heavily used corridor by deer. The areas planted with trees were recently converted from row crops.

Fencing system: Two strand baited polywire/aluminum wire fence using a AC-powered charger sized to provide a minimum of 6,000-7,000 volts at all three sites. A total of three chargers were purchased, two chargers were

hit by lightning and totally destroyed. The bottom wire was 17-gauge aluminum used to carry the current without voltage loss around the large perimeters used. The top wire was polywire with crossover pieces to the bottom aluminum wire at regular intervals. The fence was baited using a commercially available aluminum cup stuffed with cotton and saturated with a deer attractant.

* **Perimeter:** 8,000 linear feet total for all areas.

* **Cost:** initial cost for AC-powered charger, wire, posts, etc was supplemented with the purchase of two replacements chargers destroyed by lightning. Total cost of \$2,700. This amounts to a cost of \$0.34 per linear foot including the charger.

Results: Little if any browsing was recorded during the first growing season. Survival of seedlings was 85-90 percent in Fall 1995 according to the assessment by the state forester. Continuous snow cover during the winter of 1996 resulted in heavy use of the area for bedding, cover and browsing, despite the fence. Continual maintenance of the fence was required almost everyday in the winter. The bottom aluminum wire was broken by deer consistently, with few breaks of the polywire. An established deer trail through the 10-acre area was so heavily used that a 50-foot plus wide, fenced corridor was installed. It did appear that deer used this path and strayed less into the adjacent fenced areas. A 20-foot wide opening midway through the 6-acre area did not appear to be used by deer. Subjective evaluation of browsing in November 1996 found heavy damage and mortality of most of the oak species. Browsing was heavy on the ash trees but most were still alive. There was little if any evidence of browsing on the eastern red-cedar or black locust.

Site 2 - Washington Suburban Sanitary Commission - A total of 25 acres on two sites had been planted in 1993 with 622 - 756 trees per acre of loblolly pine (Figure 2). About 100 hardwood trees per acre were planted on area 1 and protected with tree shelters. Both sites had large amounts of multi flora rose. Area 1 was 15 acres and area 2 was 10 acres. Seedlings were unable to grow beyond 1-2 feet on area 1 and beyond about 3 feet on area 2 by 1995 due to severe deer browsing. Fencing was installed in the spring of 1995.

Landscape evaluation - Located within the WSSC watershed, this area is comprised of large farm fields adjacent to the reservoir and its wooded buffer. There is no heavy residential development in this area but hunting is limited and deer population control is not effective. Deer are regularly seen in the area during day and herds of 40 - 70 deer not uncommon. While much of the field crop areas are regularly cultivated, excellent early successional habitat for deer is found in the two planting areas and other areas that surround them.

Fencing system: Two strand baited polytape/aluminum wire fence used with a battery-powered charger and solar panel installed at each area. A minimum of 4,800 volts was consistently measured at the fences on both areas. The bottom 17-gauge aluminum wire was used to carry the current without voltage loss around the large perimeters used. The top wire was wide polytape with crossover pieces to the bottom aluminum wire at regular intervals to maintain voltage. The fence was baited using pieces of flashing coated inside with peanut butter

* **Perimeter:** Total of 6,630 feet - Area 1(15 acres) 3,630 feet; Area 2(10 acres in two 5-acre blocks) 3,000 feet.

* **Cost:** cost for two solar-powered chargers (\$1,072), polywire, aluminum wire, posts, insulators, etc - \$2,000. This comes to \$0.30 per linear foot including the charger.

Results:

Part of areas 1 near the woods was not fenced to allow some cover for the deer and stay away from an established deer trail. The WSSC staff person maintaining the fencing provided very useful information on how deer interacted with the fence based on regular visual observations. When the fence was first installed, deer were seen touching it, jumping at the shock, and quickly leaving the area. After this, when deer approached the fence, they tended to walk along it to try and find an entrance, or walked around the end. Deer still jumped into the area, especially when spooked. However, observations indicated that fewer deer bedded down in the area, deciding instead to use other areas.

After being protected for two growing seasons, the loblolly pine trees in area 1 have recovered well. A walk-through assessment in November 1996 found only two browsed stems in the entire area with heights of seedlings averaging around 2 - 4 feet, with full branching. This contrasts sharply with initial inspection of the area in early 1995 prior to fence construction, when all stems were severely browsed with little remaining new growth.

Area 2 was divided into two 5-acre parcels with a 15-foot corridor to allow deer to pass through. It was felt the deer may get impatient when walking along the long side of the area and would use the opening instead of jumping the fence. Observations indicate the deer were suspicious of the narrow corridor and failed to use it. Instead they walked around the corner. If a corridor is used in a fencing application, it should be very wide (40 feet plus).

The trees in area 2 have also responded well with little browsing evident in the spring or fall of 1996. Browsing on the trees outside the area from the winter of 1996 was severe compared to those inside the fenced area. Most of the trees now average 3 to 6 feet and the fencing will probably be removed after the winter of 1997 and used elsewhere.

Site 3 - Tom Niblock Black Walnut Plantation - A total of 4 acres in three areas. Area 1 is a 3 acre black walnut plantation about 4 years old at the time the fence was installed. Two other small areas totaling about 2 acre requiring protection were a group of fruit trees and a meadow newly planted with some walnut trees. The fence was installed in spring 1995.

Landscape evaluation: this rural farm property is adjacent to a large un hunted preserve, and a mosaic of woodland and crop fields. There is no heavy residential development. The landowner has been frustrated by damage from deer browsing and deer rubbing. Large herds of deer have been seen and the forest understory shows signs of severe browsing.

Fencing System: An AC-powered charger was installed in a storage shed central to all three areas to be protected. Aluminum wire was run along fences and on posts to provide power to each area. A two strand polywire fence was installed and baited with peanut butter.

* **Perimeter**: Total of 3,620 feet - Area 1 (walnut plantation) 2,340 feet; Area 2 (fruit trees) 400 feet; Area 3 (new walnut planting) 880 feet.

* **Cost**: cost for AC-charger, wire, posts were homemade, etc. was about \$370. This is a cost of \$0.10 per linear foot.

Results: Damage to trees in all areas was minimal the first growing season. Heavy damage began during the heavy snow cover in winter of 1996 and continuing through 1996 growing season. Baiting was not reapplied as required. Deer continue to penetrate the areas in fall of 1996. At this point, it would be reasonable to remove the fence and attempt to retrain the deer.

Results and Discussion

All demonstrations resulted from contacts following extension education programs on integrated pest management for deer control. All cooperators understood that use of BPP fences to protect large acreage forest plantations from deer was untested. However, the level of frustration with the problem encouraged them to try any reasonably-priced option.

All demonstrations were initiated in spring 1995 and all applications satisfactorily protected fenced areas from deer the first growing season. Starting in December 1995, the winter produced record snowfalls and abnormal consistent snowcover throughout most of the winter. This provided a worst case scenario for use of this fencing system. Snow acts as an insulator on the ground and will collapse the polytape easily, and sometimes the thinner polywire. The fence is a psychological barrier and counts on the combination of attractant and electrical shock to keep deer away. Long term downing of the fence by snow or other means enables the deer, who constantly

test the fence, to learn they can easily jump and penetrate the fence. The long-term snow cover insulated the ground and eliminated any substantial electrical shock, even when the fence is properly erected. After a fence is compromised in this fashion, it becomes largely ineffective and the best remedy is to remove the fence wire for a few months. It can then be reinstalled later and the deer retrained.

This study illustrates an important difference between the use of BPP fencing for growing season and dormant season applications. Studies on large acreage areas of field and row crops from many areas of the country show that deer damage can be significantly reduced, especially if the time period is short. However, the reader must remember that during the growing season deer have other food sources and fencing is temporary. This contrasts with applications in forest plantations where summer browsing is usually not severe due to other, more preferred, food sources. However, winter brings a lack of available food coupled with very high deer pressure to produce serious browsing as well as rubbing problem.

An additional problem with protecting forest plantations in winter is that the early successional cover created by plantation establishment provides excellent cover for deer. Horticultural operations such as fruit orchards, unlike most forest plantations, are usually mowed.

The relatively poor control of browsing on Site 1 compared to Site 2 given similar winter conditions is probably due to a combination of factors: the available habitat in the surrounding landscape, the browsing preference of the species being planted; and the size of the areas being protected.

The old field habitat created at Site 1 provided some of the best winter deer habitat in an area characterized by cleared crop fields, heavily browsed forests with little understory, and nearby habitat being destroyed by development. Therefore, deer utilized this newly created habitat heavily during the severe winter months. This contrasts with Site 2 at WSSC where large amounts of good old field habitat could be found adjacent to the fenced areas, as well as extensive wooded cover around the reservoir.

Another factor responsible for the better control on Site 2 is that loblolly pine trees on that site are not as preferred a browsing species as the oak and ash hardwood seedlings found on Site 1. Browsing preferences of deer were evident on Site 1 where the red-cedar and locust seedlings were not browsed.

The BPP fence is based on the use of an attractant such as peanut butter to attract deer to the fence and receive the shock. Applying this bait can be time-consuming. Research from Cornell University has found the use of pieces of cloth tied to the fence wire and soaked in Deer-Away increased the effectiveness of fencing systems. This research was done on small enclosures using different fencing systems. Apparently the negative effect of the repellent reinforced the negative shock of the fence. Future fencing system layouts should consider using this type of application. Reapplying the repellent would be easier than replacing bait if a backpack sprayer is used and cloth strips soaked. It is important to turn off the charge to the fence before reapplying bait for repellent.

The mixed success and high maintenance associated with BBP fencing on large acreage forest plantations suggests that growers should consider other fencing systems that utilize multi-strand steel fencing. Even on Site 2 where browsing appears to be controlled, the intensive maintenance provided by WSSC staff is unrealistic in most situations. Steel fencing would minimize breakage problems and maintenance requirements common with BBP fencing, but would require higher initial cost. *Controlling deer damage in Maryland* (Bulletin 354) provides descriptions and costs for some of these systems.

General Guidelines for BBP Fencing:

* Analyze the landscape around the area to be fenced. Avoid trying to cut across existing trails and corridors and look for other early successional habitat. Deer pressure will be higher near wooded areas and within smaller fields surrounded by woods.

- * Crops will be harder to protect from winter browsing compared to summer browsing.
- * The size of area that can be effectively protected from deer during the dormant season depends on many factors and can not be easily predicted.
- * BBP fences require constant maintenance to be effective. Breakage of wire, grounding by vegetation, rebaiting, and other needs are a major maintenance problem. If the grower cannot commit to needed maintenance, consider other fencing options.
- * Lightning strikes will destroy chargers, but the problem is isolated to certain areas. AC-chargers are cheaper to replace.
- * Heavy winter snow cover will seriously compromise fence effectiveness and increase maintenance. If heavy penetration of a fenced areas occurs, it may be best to remove the fence wire in the spring and reinstall and retrain the deer later in the summer.
- * Polytape is easier to see by deer, but easily damaged by wind, compared to polytape.
- * The use of aluminum wire to carry a charge is probably not necessary, even on large perimeters, given the improved conductivity of new products.
- * Always use AC-powered chargers if possible, even it means installing a power source to the charger. A reasonable option is to install underground or overhead wire from the charger to the fence, even for long distances.
- * Growers should consider other types of semi-permanent wire fencing systems on larger acreage to avoid maintenance problems.
- * If the deer population and pressure in an area is intense enough, it is likely any fencing effort will be compromised without serious population reduction through hunting.

References:

- 1) Kays, Jonathan S. (June 21, 1995). *Deer Protection for Small Forest Plantations: Comparing Costs of Tree Shelters, Electric Fencing and Repellents*. In: Morris Arboretum, ed. Proceedings of Tree Shelter Conference, Harrisburg, Pennsylvania.
- 2) Kays, Jonathan S. 1995. Controlling Deer Damage in Maryland. Extension Bulletin ? . Maryland Cooperative Extension Service, College Park, Maryland. Cost: \$1.50.
- 3) PACE Reports, University of Maryland, 1994 - 1995.