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Evaluation of IStop™ Cribbing and Chewing Deterrent Product to Reduce Pileated Woodpecker Damage to Utility Poles

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Abstract: Pileated woodpeckers (*Dryocopus pileatus*) can cause severe damage to utility poles resulting in significant economic losses to utility companies. Effective methods to manage damage caused by pileated woodpeckers to utility poles are needed. In August 2003, we conducted a pilot study to evaluate the effectiveness of three different application methods of IStop™ Sniff 'N' Stop Cribbing and Chewing Deterrent as potential pole treatments to reduce damage caused by pileated woodpeckers. The number of birds tested per treatment application is as follows: full treatment (n=5), plug treatment (n=1), treated wrap (n=2), and untreated wrap (n=2). Sample size was not large enough to detect statistical differences in the amount of wood removed from pole sections by

woodpeckers. Descriptive statistics indicate that the amount of wood removed by woodpeckers from pole sections fully treated with Sniff 'N' Stop deterrent decreased 71% from the pre-conditioning period. Wood removed from pole sections treated with the Sniff 'N' Stop wrap decreased 97% from pre-conditioning period. Wood removed by woodpeckers from pole sections treated with Sniff 'N' Stop plugs decreased 15% from the pre-conditioning period. Further research with larger sample sizes is warranted to determine these applications efficacy, longevity, cost effectiveness, and there effects on lineman ability to conduct maintenance. We followed animal care criteria outlined by the Animal Welfare Act and the National Wildlife Research Center, Animal Care and Use Committee during this study.

INTRODUCTION

Woodpeckers can cause severe damage to utility poles resulting in significant economic losses to utility companies. In 1981 and 1982, the Central Missouri Electric Corporation replaced 2,114 poles within their system because of direct and indirect damage caused by woodpeckers (Stemmerman 1988). Alabama Power Company spent more than $3 million in a single year replacing poles damaged by woodpecker species (Abbey et al. 2000). This figure was about half of their total pole replacement cost for that year.

Damage to poles caused by woodpeckers presents a safety hazard to workers, may promote further degradation due to decay fostered by water entrapped in holes, and may lead to collapse under adverse conditions. One example occurred outside Tampa, Florida, when a pole snapped because of woodpecker damage. The incident caused a cascading failure and overloaded a transmission substation. More than 100,000 people lost power for more than an hour (Abbey et al. 2000). Woodpecker damage is not uniformly distributed within transmission or distribution systems but rather is localized depending on the species of woodpecker, numbers, and available foraging and nesting habitat.

There are several species of woodpeckers that damage utility poles however pileated woodpeckers (*Dryocopus pileatus)* cause some of the most severe damage (Dennis 1964, Rumsey 1970). The most extensive damage occurs when birds are excavating nesting cavities during February and March, and roosting cavities during September through December (Dennis 1964, Jorgensen et al. 1957). These cavities are mostly found between 7 and 17 m above the ground and on the south side of poles (Dennis 1964).

Several techniques are available for alleviating woodpecker damage, such as exclusion, mechanical and pyrotechnic devices, chemical repellents, and lethal removal (Abbey et al 2000). However each of these techniques has limitations because of cost, logistics, effectiveness or a combination of these factors. For example, protective barriers such as wire or wrap are difficult to install, interfere with lineman access, and in some cases pileated woodpeckers have defeated the materials. A 19 gauge galvanized welded wire mesh (1.25 x1.25 cm) is the most widely used pole wrap by the utility industry to reduce woodpecker damage to poles. However, under control testing, pileated woodpecker damage was greatest to poles wrapped with 19 gauge wire. Woodpeckers were capable of bending or breaking welds and/or wires in a relatively short time period.

The least damage was to poles wrapped with 16 gauge welded wire (Cummings et al. 2001 unpublished data).

Most chemical pole treatments such as creosote have been found to be ineffective (Rumsey 1970). Ammoniacal copper zinc arsenate (ACZA) has shown some effectiveness in deterring woodpeckers. Isopheron has produced the most favorable results, but there are concerns about the toxicity to non-target organisms. Methyl anthranilate, a food grade product that is GRAS listed (generally recognized as safe) has been tested in two-choice experiments but damage to treated and untreated poles from pileated woodpeckers was similar (Cummings et al. 1998, unpublished data).

Another common method of utilities for exclusion of woodpeckers is to fill their cavities with foam or epoxy void fillers. Almost from the inception of using manufactured materials to fill cavities, there have been questions and speculation about their strength restoration capabilities. Limited testing has been conducted to assess the strength restoration characteristics of the various repair methods and/or products. The available evidence supporting either that they do or do not restore strength is at best, speculative and anecdotal.

While many electric utilities consider resolving woodpecker damage to wood poles as a high priority, no chemical treatments have been developed and commercialized for new wood poles or as a remedial treatment for in-service poles.

METHODS

We captured pileated woodpeckers between April 12-24, 2003 in the Mark Twain National Forest, Missouri and the Ozark National Forest, Arkansas. Sixteen pileated woodpeckers were captured using mist nets and a taped pileated woodpecker call (York et al. 1998). A mortality occurred during transportation to the National Wildlife Research Center, Fort Collins, Colorado. Woodpeckers were housed separately in covered outdoor enclosures (3 m x 7 m x 3 m) with free access to one untreated utility pole section (20 cm x 122 cm), food, and water. We followed animal care criteria outlined by the Animal Welfare Act and the National Wildlife Research Center, Animal Care and Use Committee during this study.

The daily diet for each pileated woodpecker consisted of a combination of 78 g of canine diet can dog food (beef), 4 g of mealworms, and 100 g of mixed chopped fruit (apples, oranges, bananas, and grapes). Following the completion of the study, each pileated woodpecker was returned to its capture site.

On August 7, 2003, we initiated testing of Sniff 'N' Stop cribbing and chewing deterrent. We used 11 pileated woodpeckers that consistently damaged untreated poles to evaluate different applications of Sniff 'N' Stop deterrent: full treatment, plug treatment, and wrap treatment.

Full Treatment: The utility pole section was completely covered with a 0.30 cm to 0.63 cm layer of the deterrent material using a putty knife (Figure 1).

Plug Treatment: The utility pole section was perforated with 1.27 cm diameter holes drilled 2.5 cm deep and spaced 7.6 cm apart. Each hole was filled with the deterrent using a trowel (Figure 2). The remaining surface area of the pole was left untreated.

Wrap Treatment: A PVC sheet precurred with Sniff 'N' Stop deterrent was wrapped around the pole and nailed at the seam (Figure 3). It was suspected that the PVC sheet covering material alone could act as a deterrent, thus we also evaluated the same material without the layer of Sniff 'N' Stop. This material was painted to match the color of the Sniff 'N' Stop (Figure 4).

At the start of each test, pileated woodpeckers were presented with one untreated utility pole section, 20 cm x 122 cm, placed on metal stands for 4 pre-conditioning days. Following this period, poles were removed from the enclosures for treatment and replaced with similar untreated poles for 24 hours. During this period test poles were randomly assigned a treatment, treated, and allowed to completely dry. Immediately following this period test poles were placed back into their respective enclosures for 10 days.

Woodpecker damage to test poles was assessed daily. Wood that was removed from each test pole was collected and placed in a drying oven for 24 hours to standardize the moisture content and weighed.

We compared the last day of the pre-conditioning period to the post-treatment period using a 2-factor randomized block design that measured the effects of the treatments over days. A mixed linear model (McLean et al. 1991, Wolfinger et al. 1991) was used to compare damage levels among treatments and experiment days. SAS PROC MIXED (Littell et al. 1996) was used to carry out the analysis. We also used descriptive statistics to compare the last-day of the pre-conditioning period to the post-treatment period.

RESULTS

The number of poles per treatment application was as follows: 5 poles received a full treatment, 1 received a plug treatment, 2 received a wrap treatment and 2 poles received a control wrap. Initially the plug treatment was tested on two pileated woodpeckers but one bird became sick and tested positive for West Nile Virus so data from this bird was not included in the analysis for this test. There were no significant difference between treatment applications ($F=3.2$; 3, 6 df; $P=0.1051$). Small sample size, variability of woodpecker damage to poles, and limited replication per treatment limited our ability to say with confidence that the observed differences in pre-conditioning and post treatment values is a random anomaly detected because of small sample sizes or a result of a treatment effect.

A descriptive analysis of the data showed that the three treatment applications of Sniff 'N' Stop deterrent reduced woodpecker damage to respective pole sections (Figure 6).

The amount of wood removed by woodpeckers from pole sections (n=5) treated with a full application of Sniff 'N' Stop deterrent decreased from an average of 41.5 g of wood removed the last day of pre-conditioning period to an average of 12.1 g of wood removed each day during the post-treatment period (Figure 7). This amounted to a 71% reduction in wood removed (Figure 8). The amount of wood removed decreased from the last pre-conditioning day through the post-treatment period (Figure 9), but there was a high degree of variability in the amount of wood removed among poles and over days (Figures 10-14). In two cases, there was little change from pre to post-treatment amounts of wood removed (Figures 12-13), and both of these birds produced some post-treatment damage that was higher than the last pre-conditioning day. Three of the woodpeckers, when exposed to a fully treated pole, showed an immediate decrease in the amount of wood removed which persisted throughout the post-treatment period of the experiment (Figures 10, 11, and 14).

The amount of wood removed by woodpeckers from poles treated with the plug application (n=1) decreased from 58.9 g of wood removed the last day of the pre-conditioning period to an average of 50.1 g of wood removed each day during the post-treatment period (Figures 15 and 16). This amounted to a 15% reduction in wood removed (Figure 8).

The amount of wood removed by woodpeckers from poles treated with the wrap application (n=2) of Sniff 'N' Stop deterrent decreased from an average of 55.6 g of wood removed the last day of pre-conditioning period to an average of 1.7 g of wood removed each day during the post-treatment period (Figure 7). This amounted to a 97% reduction in mean daily amount of wood removed (Figure 8). The amount of wood removed from both Sniff 'N' Stop treated wraps was similar during the pre-conditioning and post-treatment periods (Figures 17-19).

The amount of wood removed by woodpeckers from poles treated with the PVC wrap decreased from an average of 23.9 grams of wood removed the last day of pre-conditioning period to an average of 11.7 g of wood removed each day during the post-treatment period (Figure 7). This amounted to a 51% reduction in wood removed (Figure 8). Significant variability between the two PVC wraps made it difficult to determine if there was any deterrent effect created by the material (Figure 20). One of the woodpeckers exposed to the PVC wrap removed less post-treatment amounts of wood than any other bird on test (Figure 21). The other bird, which was exposed to the PVC wrap, increased the amount of wood removed during the post-treatment (Figure 22).

DISCUSSION

Statistical analysis of the data indicated that there was high variability among treatments because of the limited replication incorporated into the design of this pilot study. Also, descriptive analysis of the data indicates that some birds were deterred by the materials while others were not. These discrepancies in woodpecker behavior are probably attributed to the limited replication within this test.

Woodpecker response to the full treatment varied. Some birds did not seem deterred by the product while others did not remove significant amounts of wood from treated pole sections. The large difference in wood removed from poles during the pre-conditioning period and post-treatment suggests that the Sniff 'N' Stop full treatment warrants further testing.

The amount of wood removed by woodpeckers during the plug treatment test was high during days 1-4 of the post treatment period. However on day 5, one of the birds contracted West Nile Virus so it was not included in the test. With no replication for the plug treatment it is very difficult to conclude what repellency effect, if any, existed. There was no indication that the plugs deterred the woodpecker from removing wood from the pole surface.

Based upon the statistical analysis the plug treatment, at 7.6 cm spacing, appeared to have no effect on the amount of wood removed by woodpeckers. The plugs themselves were rarely damaged but woodpeckers removed wood surrounding each plug to varying degrees. This indicates that the plug treatment did not produce any aversive effects that caused woodpeckers to avoid the area adjacent to the plugs on the pole section (Figure 5). However, varying the spacing and the size of the plugs warrants further investigation because of the practical and economic benefits of this type of pole treatment.

Based upon the descriptive statistics, the Sniff 'N' Stop wrap was the most effective of the deterrents tested. It produced the greatest change in the amount of wood removed from the pre-conditioning period to post-treatment period for any of the treatments tested. The wrap did appear to inhibit perching by creating a barrier, which forced woodpeckers to concentrate damage on exposed surfaces.

There were no statistical differences between the PVC wrap and the Sniff 'N' Stop treated wrap. The descriptive statistics showed that non-significant numerical differences between the treated and untreated wraps exist. The Sniff 'N' Stop treated wraps produced substantially less post-treatment damage than the PVC wraps (Figure 8). This suggests that the treated wrap protected wood surfaces better that untreated PVC wrap.

Use of any deterrent will not be based solely on the effectiveness of the product, but on its cost, application, maintenance, and compatibility with linemen ability to access the pole. These issues need to be addressed before this product is used.

Determining the cost effectiveness of the various treatments will be needed to decide if the use of the material is warranted. Each I-Stop CC 500 Putty container will cover 44 ft^2 of surface area at a cost of \$264.95, or \$6.02 dollars per ft^2. Future studies should be conducted to determine if the protection justifies the expense.

This pilot study was not able to generate statistical evidence to support the claim that Sniff 'N' Stop is an effective deterrent for pileated woodpeckers. Observed numerical differences in the amount of wood removed from pole sections by woodpeckers indicates that Sniff 'N' Stop in some cases could be a potentially effective deterrent. Considering the small sample size used in this study and numerical differences in the amount of wood removed between the pre-conditioning period and post-treatment period for some treatments, further investigations of Sniff 'N' Stop deterrent is warranted.

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Figure 1: National Wildlife Research Center Staff apply the IStop-CC™ Sniff 'N' Stop deterrent (dark brown color), full treatment, to a utility pole section.

Figure 2: IStop-CC™ Sniff 'N' Stop deterrent, plug treatment. Each pole was perforated every 7.6 cm around the circumference of the pole section. Holes were filled with the product using a hand trowel.

Figure 3: IStop-CC™ Epoxy Resin System, wrap treatment. A precurred sheet of epoxy and PVC sheeting was nailed to the pole and cut to fit. Top of pole, as seen, was left exposed.

Figure 4: Painted PVC sheeting. This is the same type of sheet material the epoxy resin was applied to. Material was painted to mimic the epoxy treated wrap poles.

Figure 5: Plug treatment with signs of extensive amounts of pole damage surrounding the plug. Plug showed no effect on reducing the amount of wood removed from untreated surfaces adjacent to the plugs.

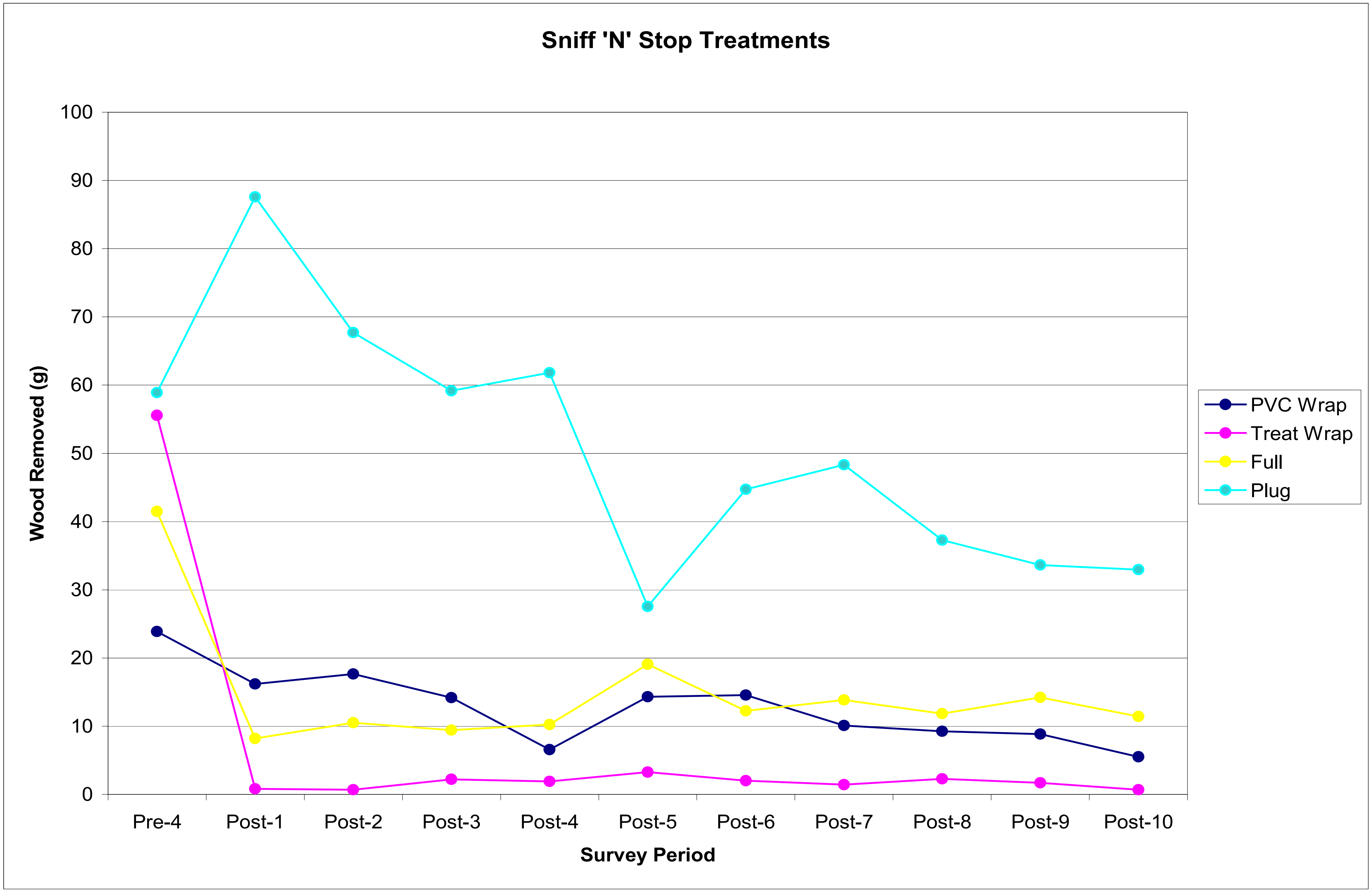

Figure 6: Wood removed by woodpeckers by treatment. Damage values are the mean daily values for all birds exposed to each of the Sniff 'N' Stop and PVC wrap treatments.

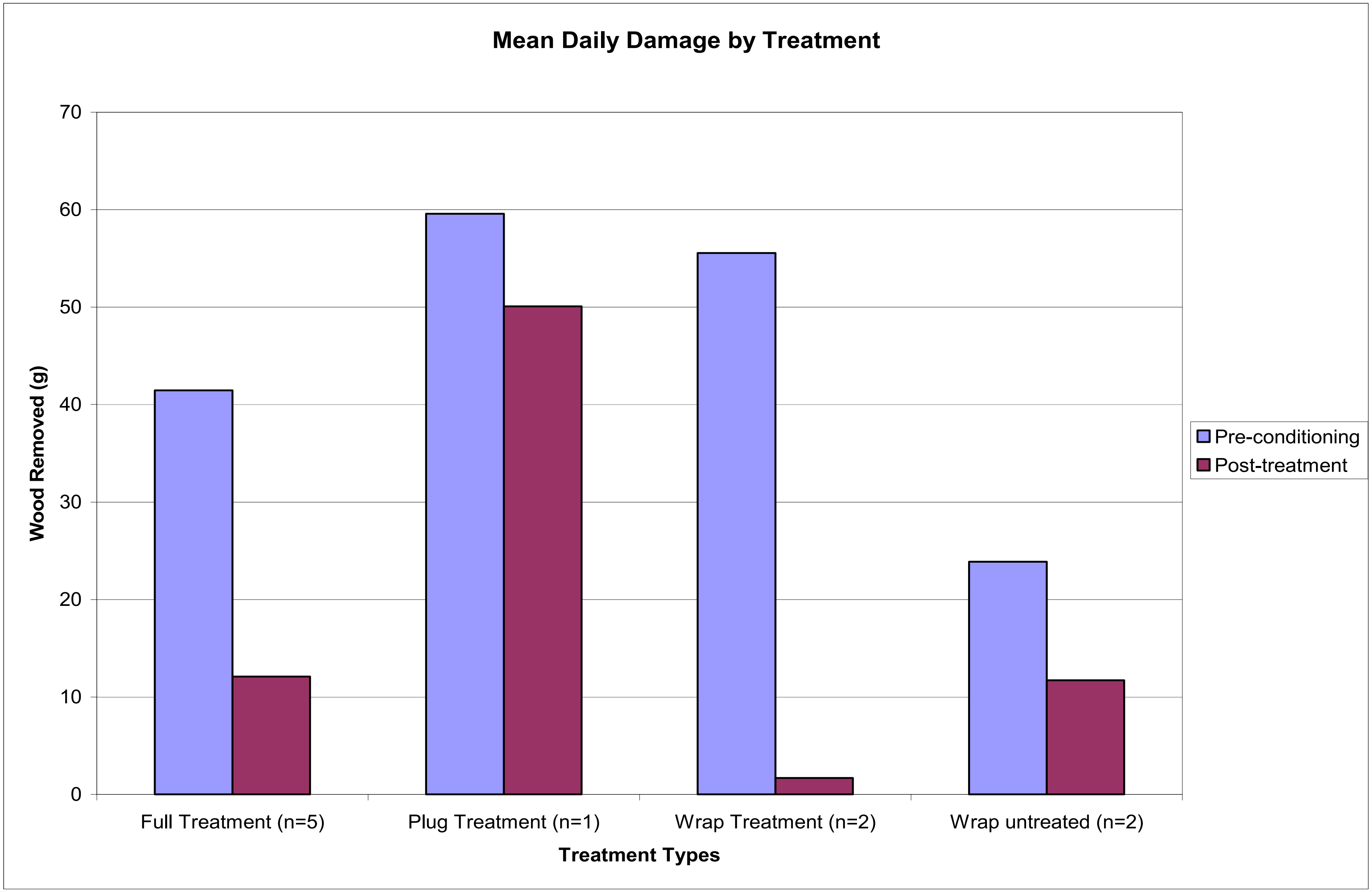

Figure 7: Mean daily amount of wood removed by treatments for the three Sniff 'N' Stop deterrents and the untreated PVC control wrap.

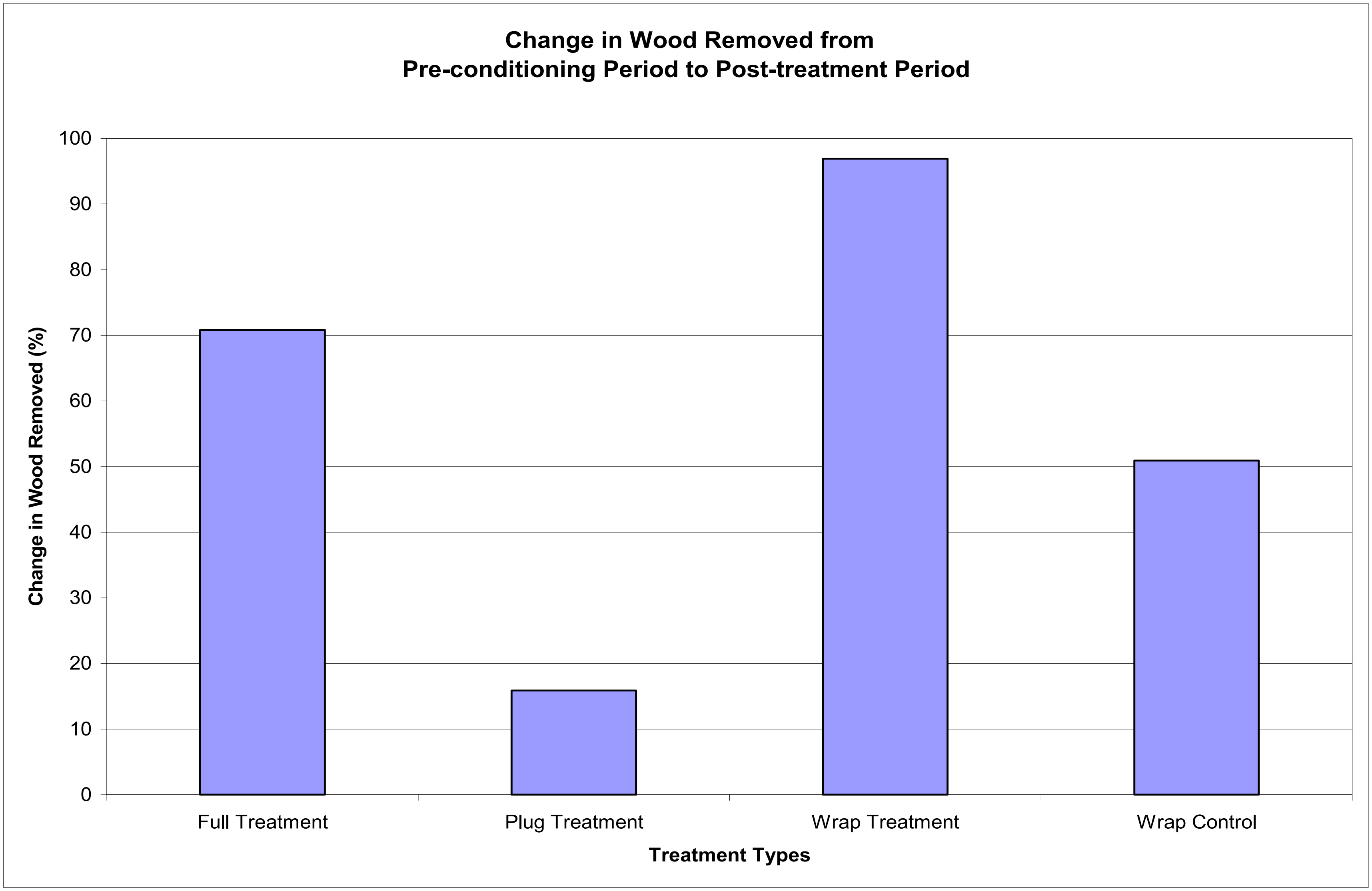

Figure 8: Change in the mean amount of wood removed from the pre-conditioning to post-treatment period for the three Sniff 'N' Stop deterrents and the untreated PVC control wrap.

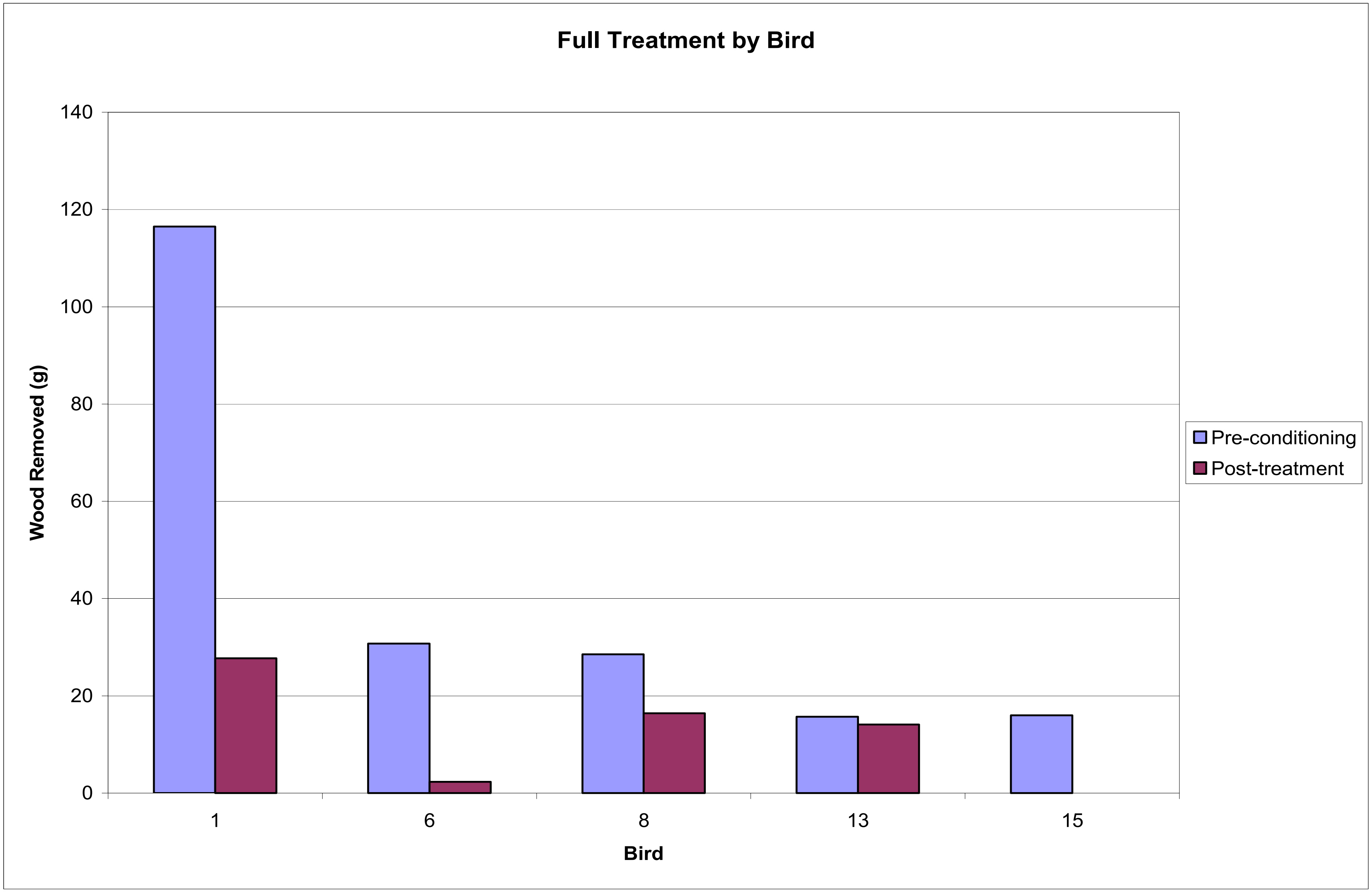

Figure 9: Amount of wood removed by woodpeckers from pole section treated with Sniff 'N' Stop deterrent.

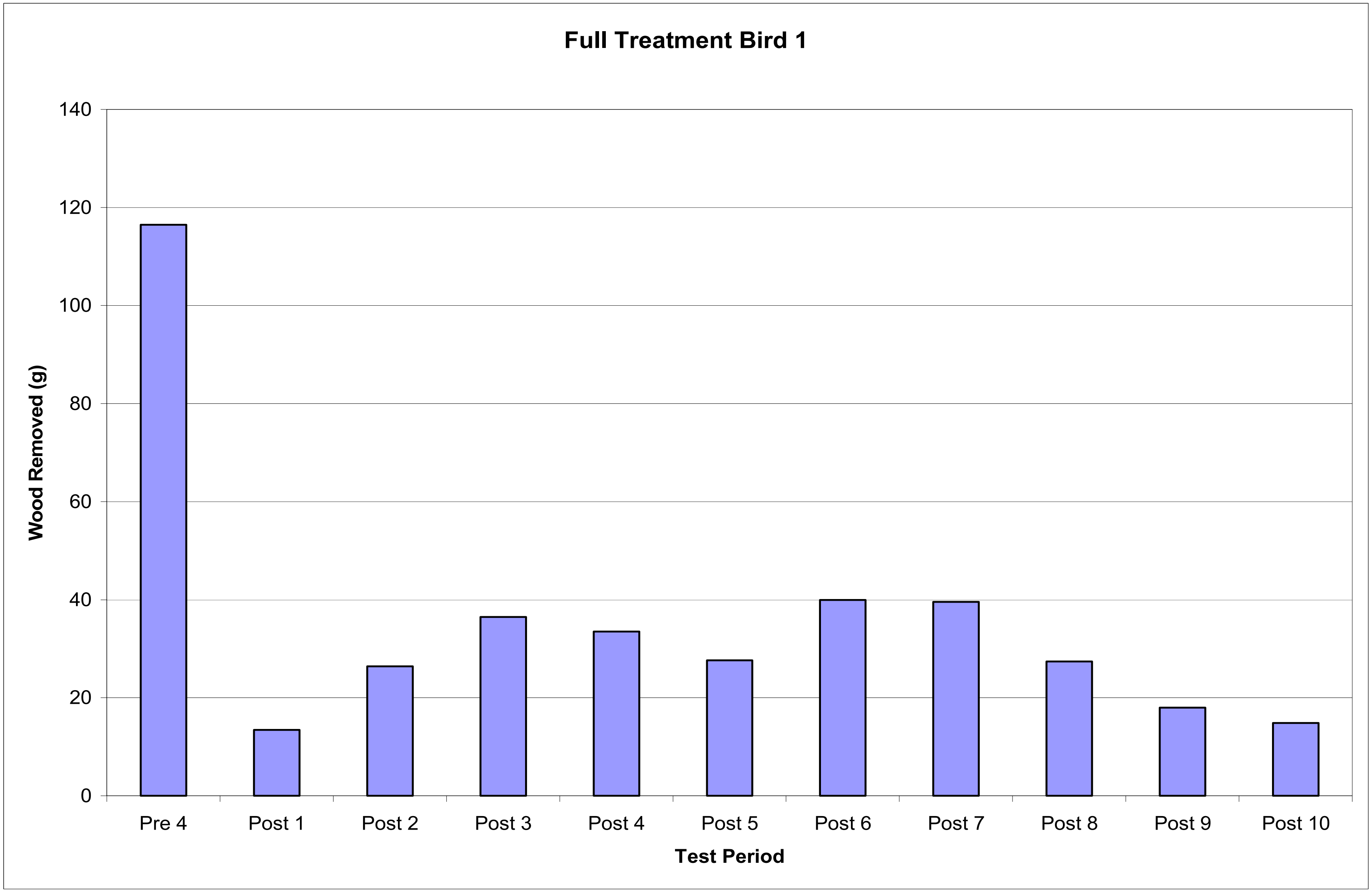

Figure 10: Daily amount of wood removed by pileated woodpecker in cage 1 from pole section with a full treatment.

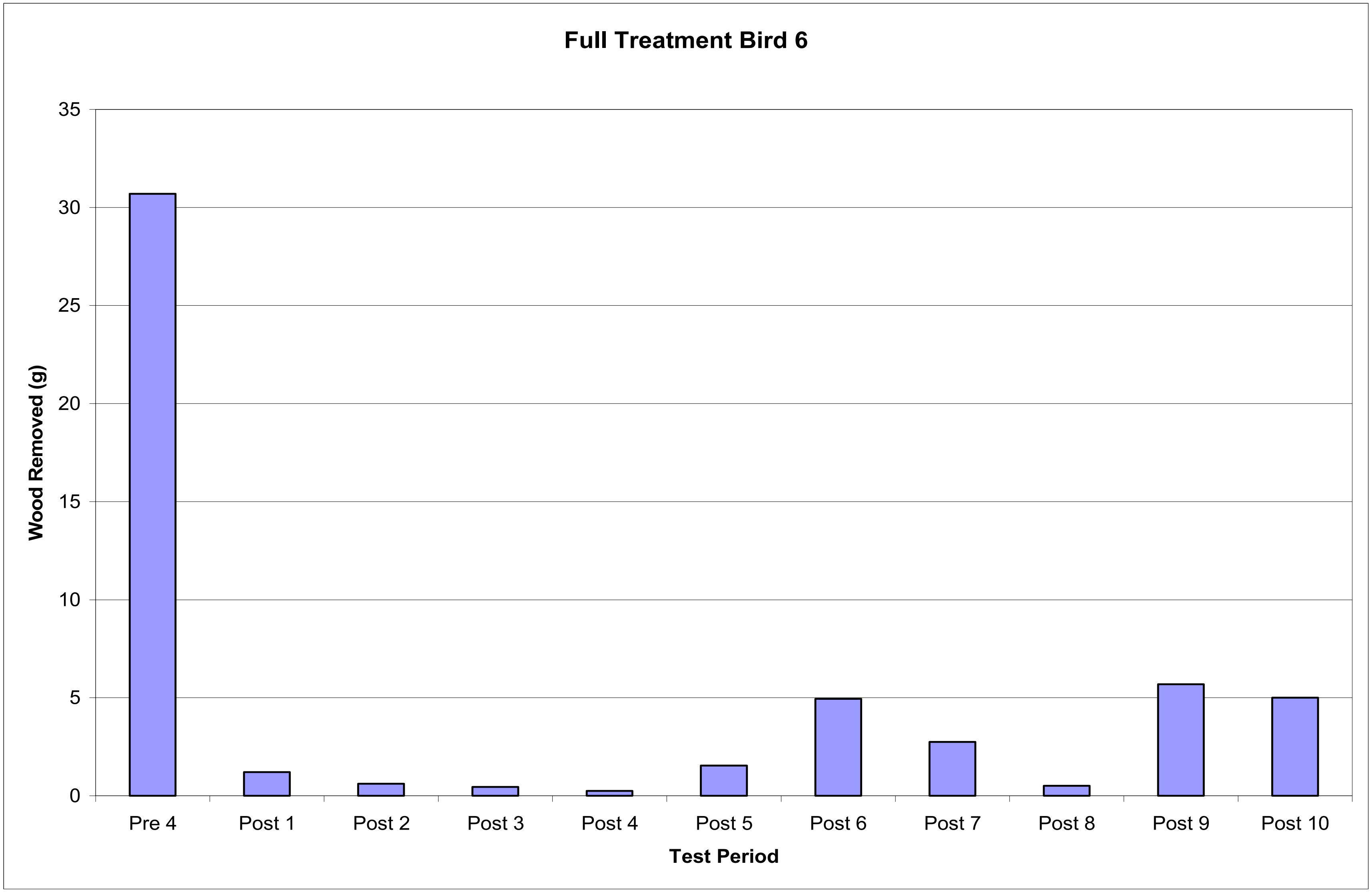

Figure 11: Daily amount of wood removed by pileated woodpecker in cage 6 from pole section with a full treatment.

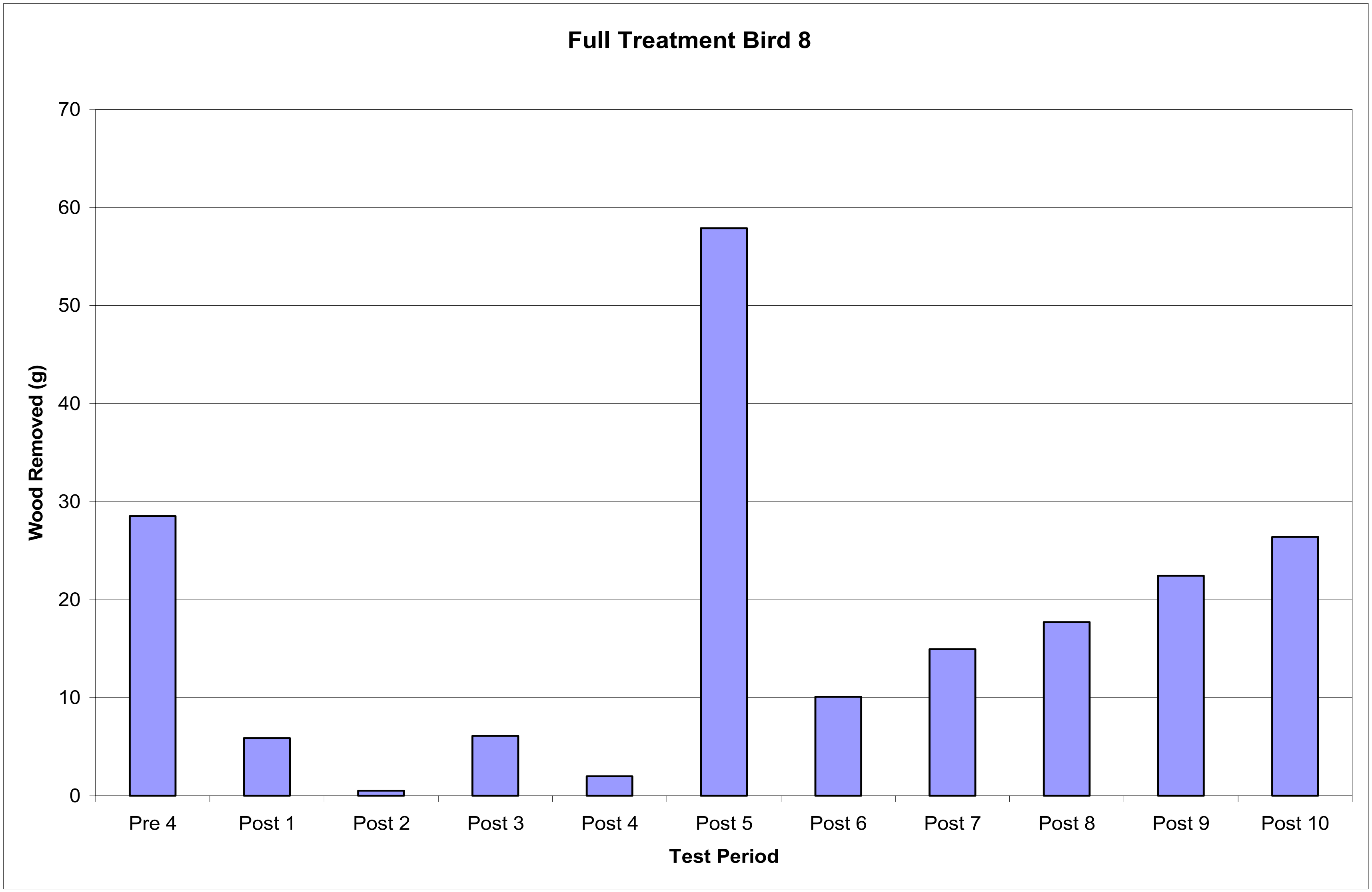

Figure 12: Daily amount of wood removed by pileated woodpecker in cage 8 from pole section with a full treatment.

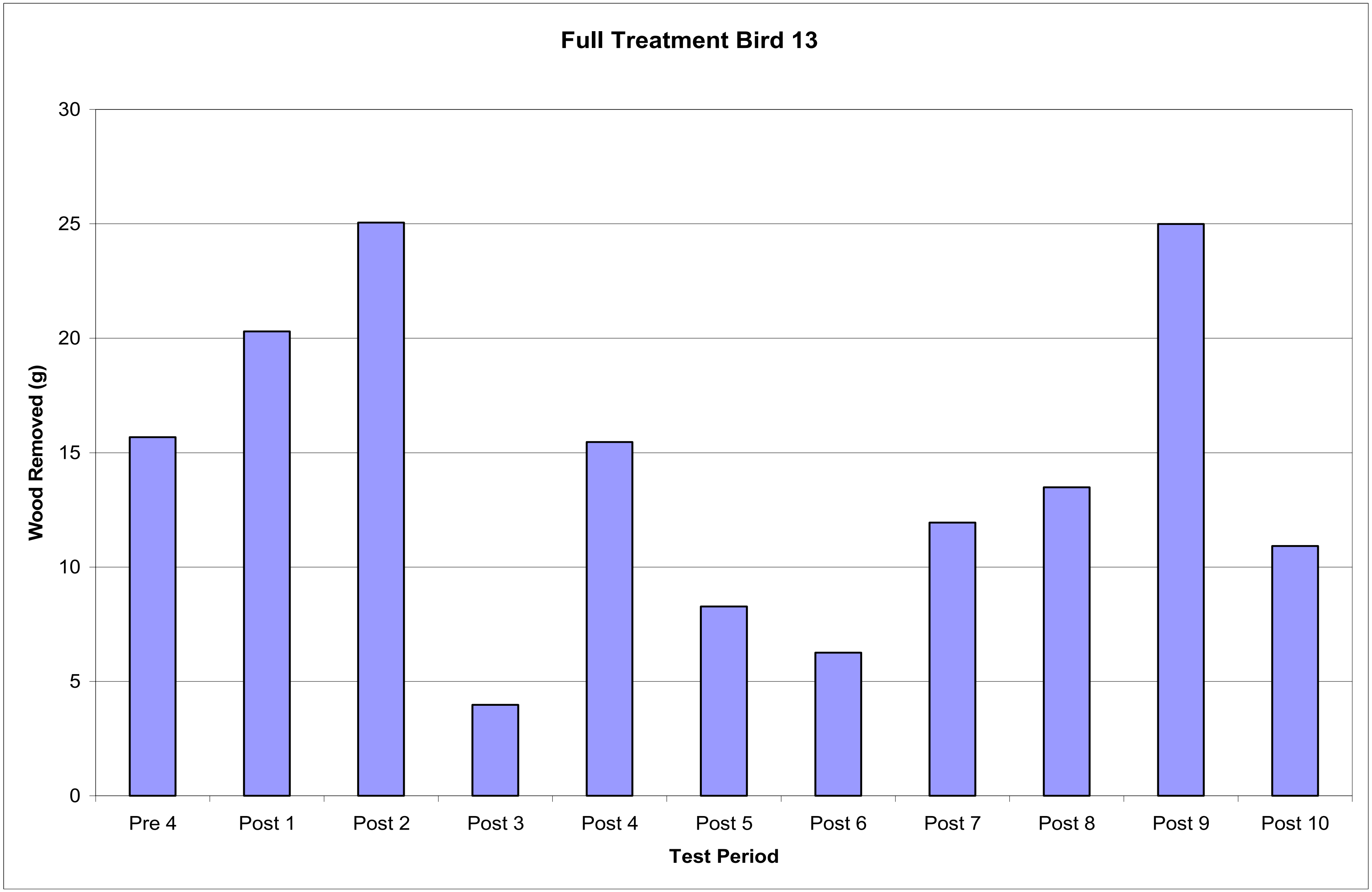

Figure 13: Daily amount of wood removed by pileated woodpecker in cage 13 from pole section with a full treatment.

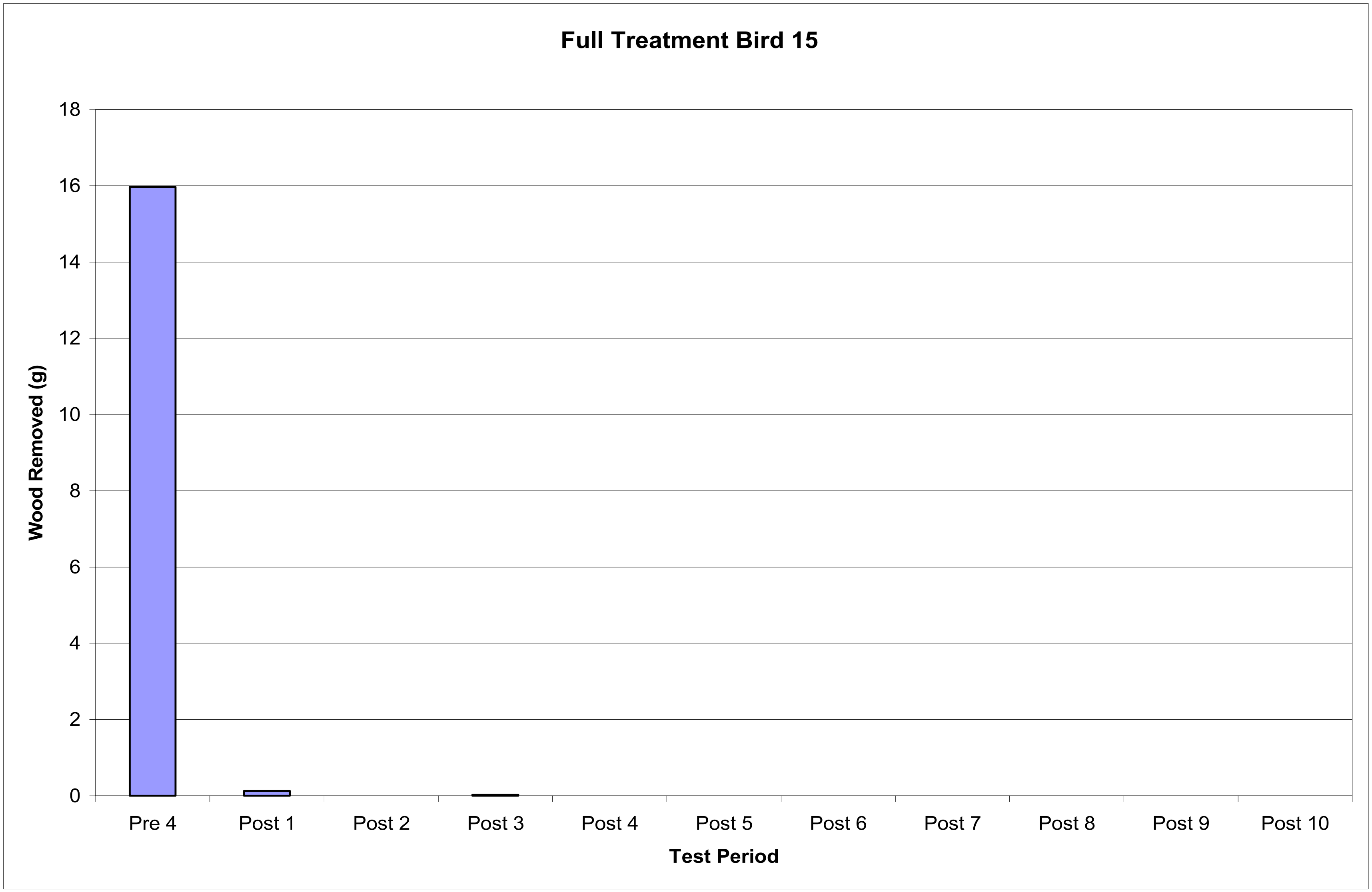

Figure 14: Daily amount of wood removed by pileated woodpecker in cage 15 from pole section with a full treatment.

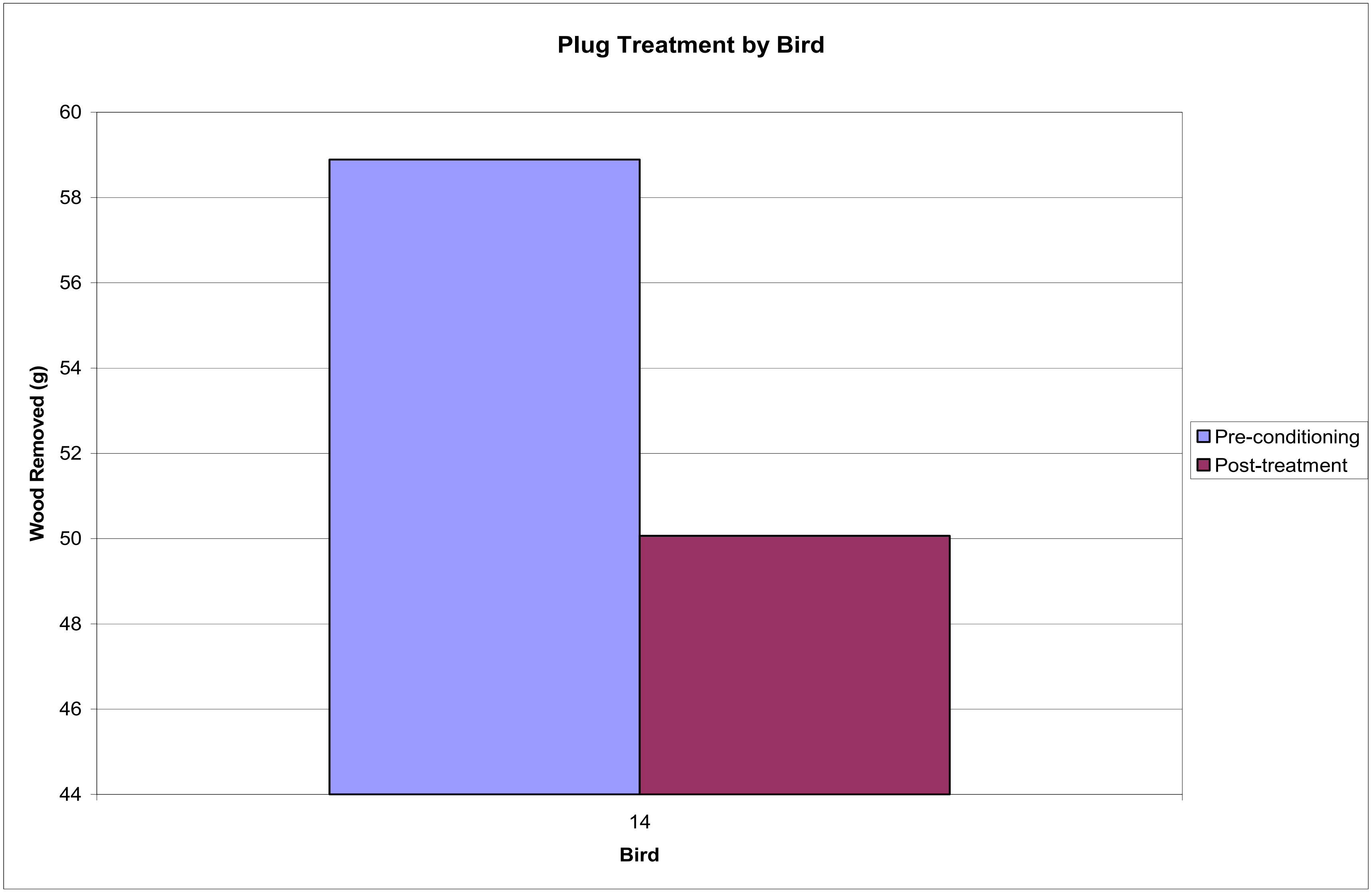

Figure 15: Mean daily amount of wood removed during the pre-conditioning and post-treatment periods for the bird exposed to the plug treatment.

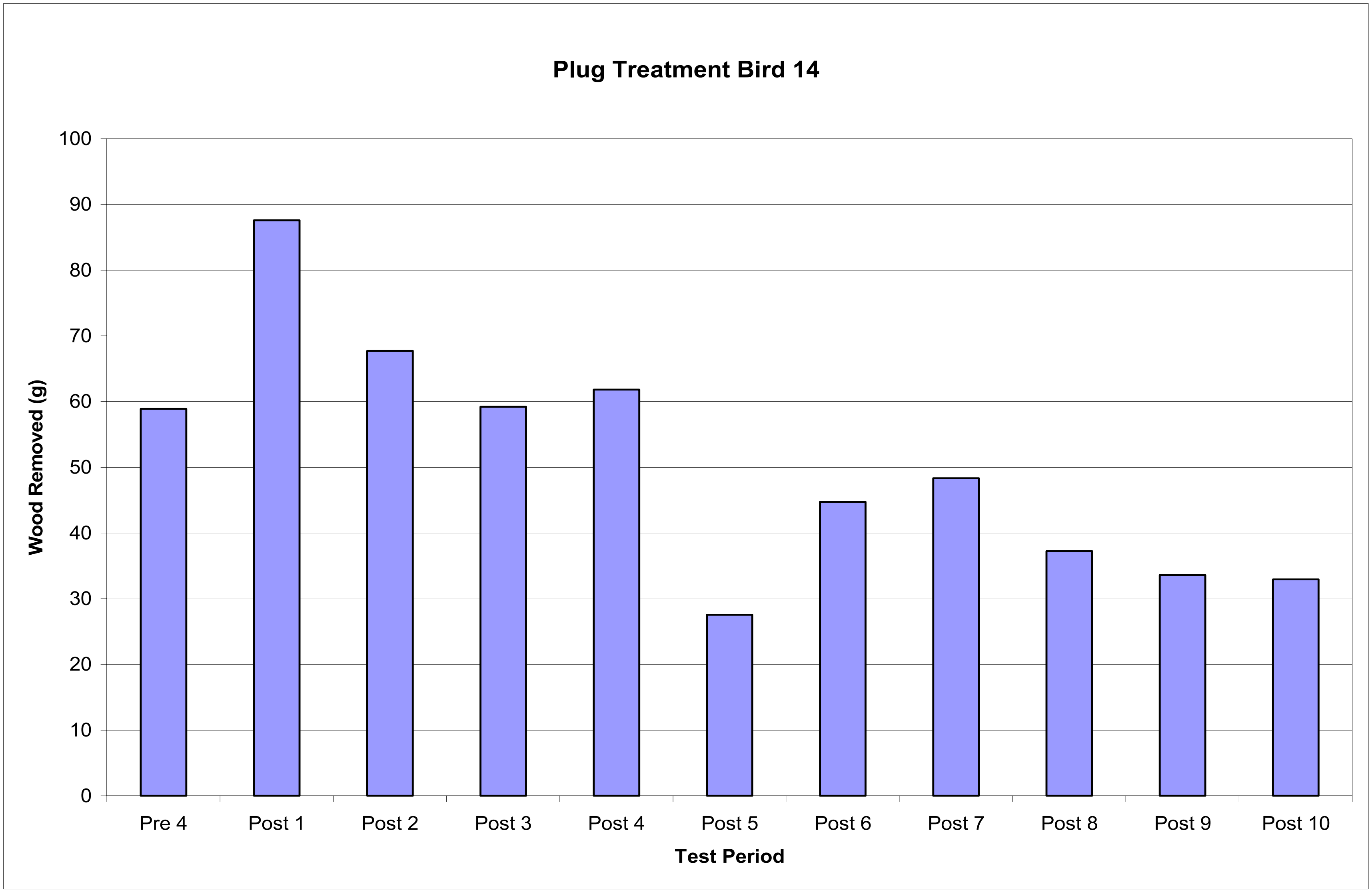

Figure 16: Daily amount of wood removed by pileated woodpecker in cage 14 from pole section with a plug treatment.

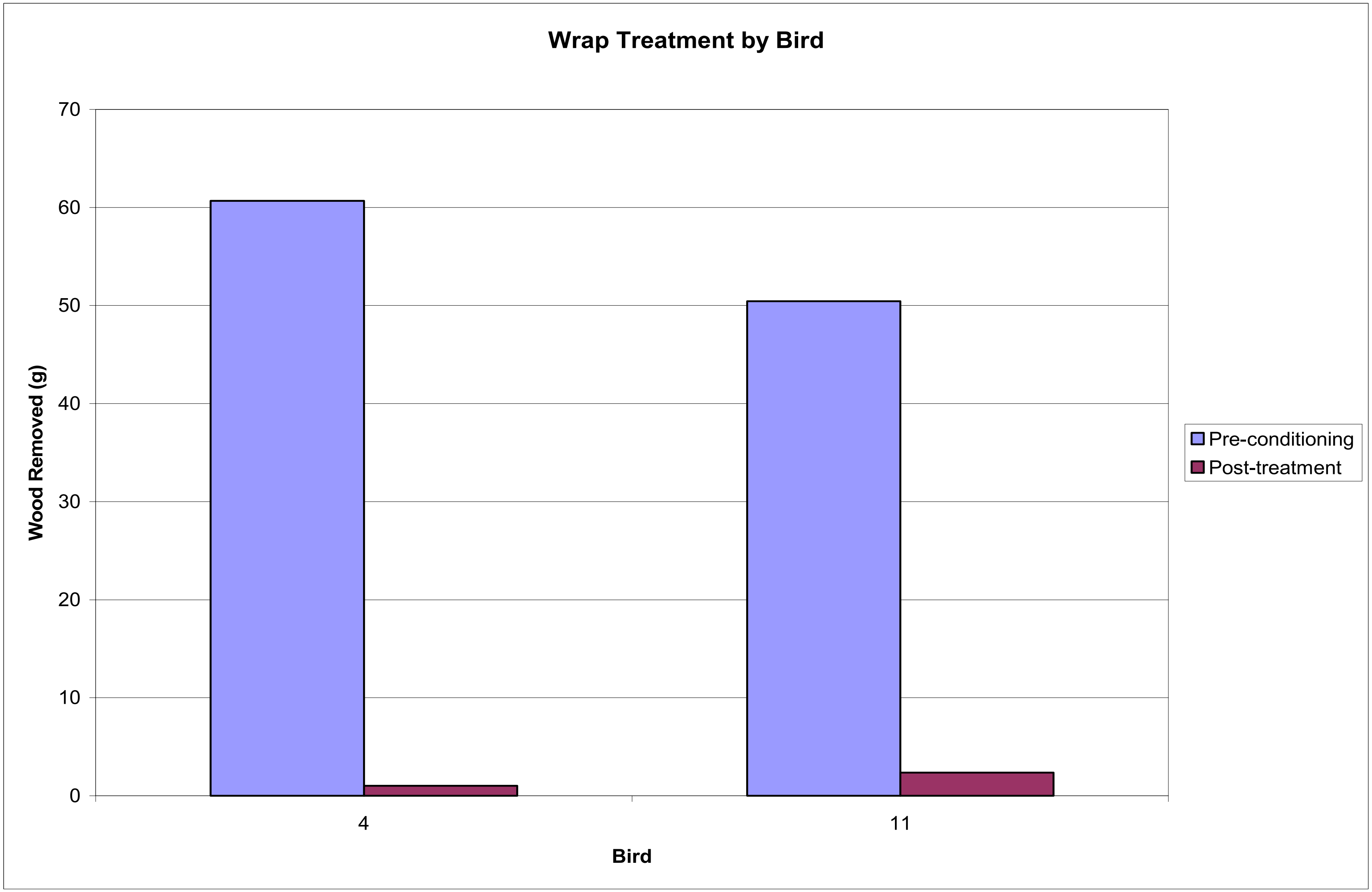

Figure 17: Mean daily amount of wood removed during the pre-conditioning and post-treatment periods for the birds exposed to the wrap treatment.

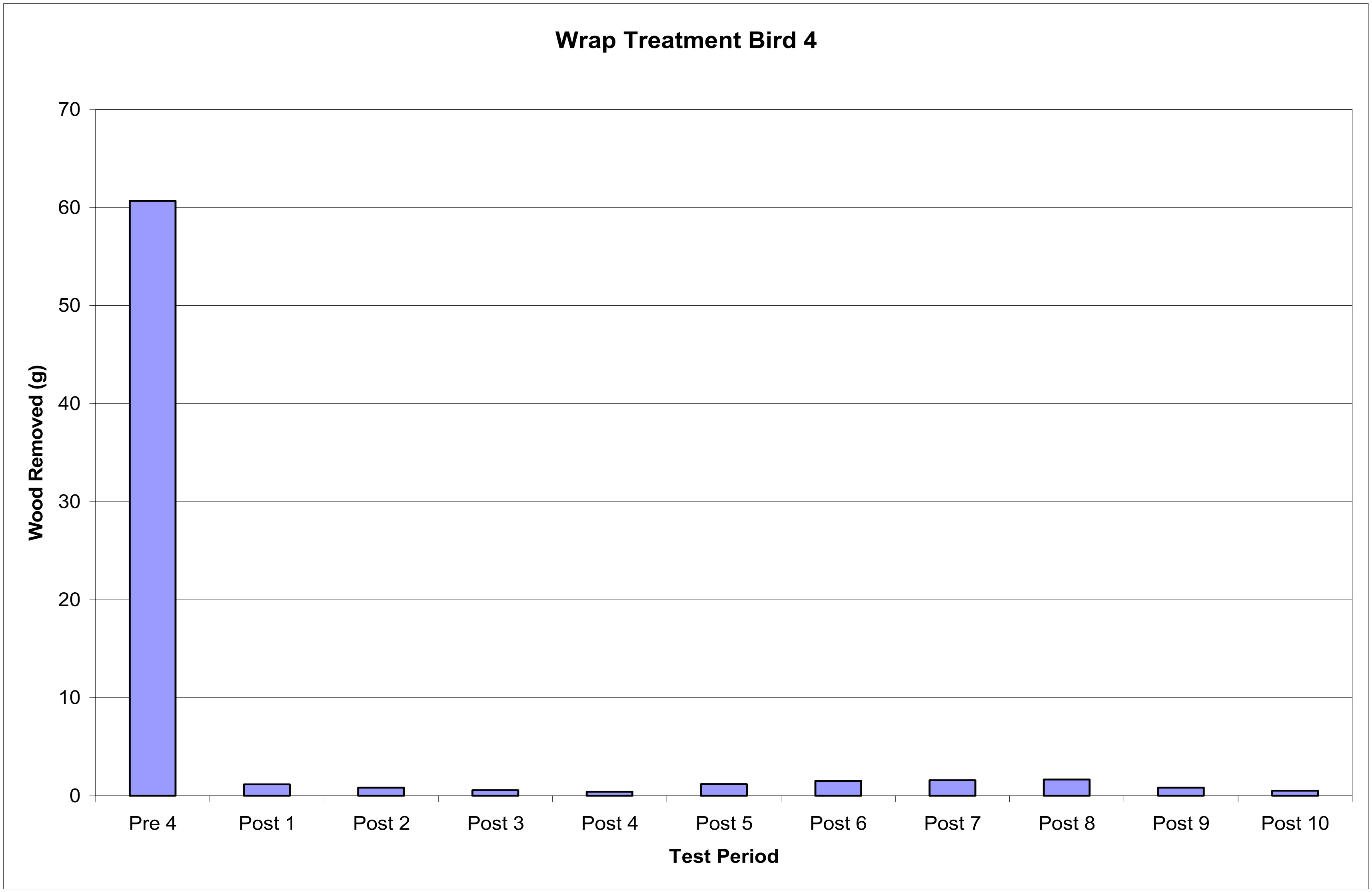

Figure 18: Daily amount of wood removed by pileated woodpecker in cage 4 from pole section with a wrap treatment.

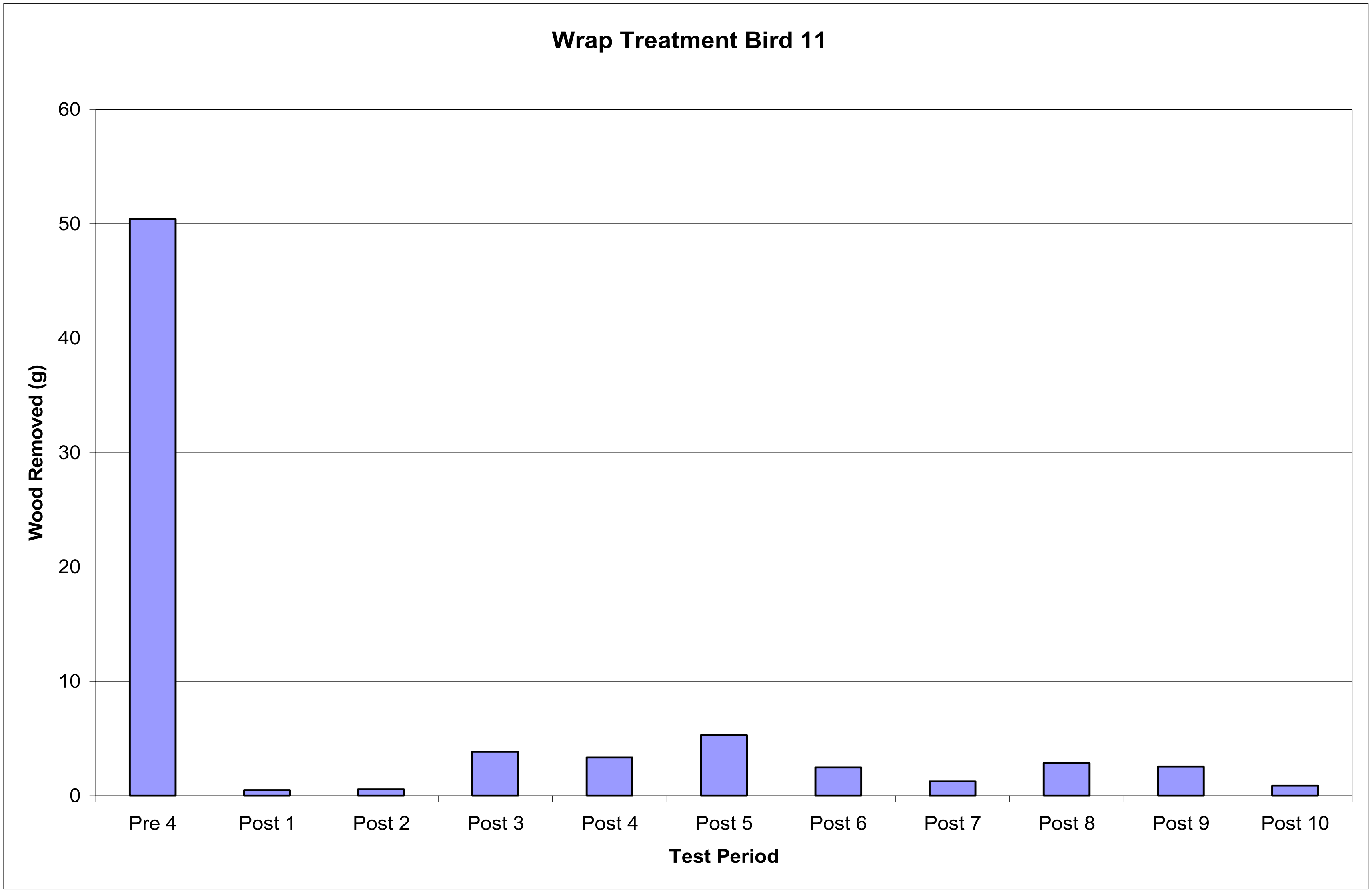

Figure 19: Daily amount of wood removed by pileated woodpecker in cage 11 from pole section with a wrap treatment.

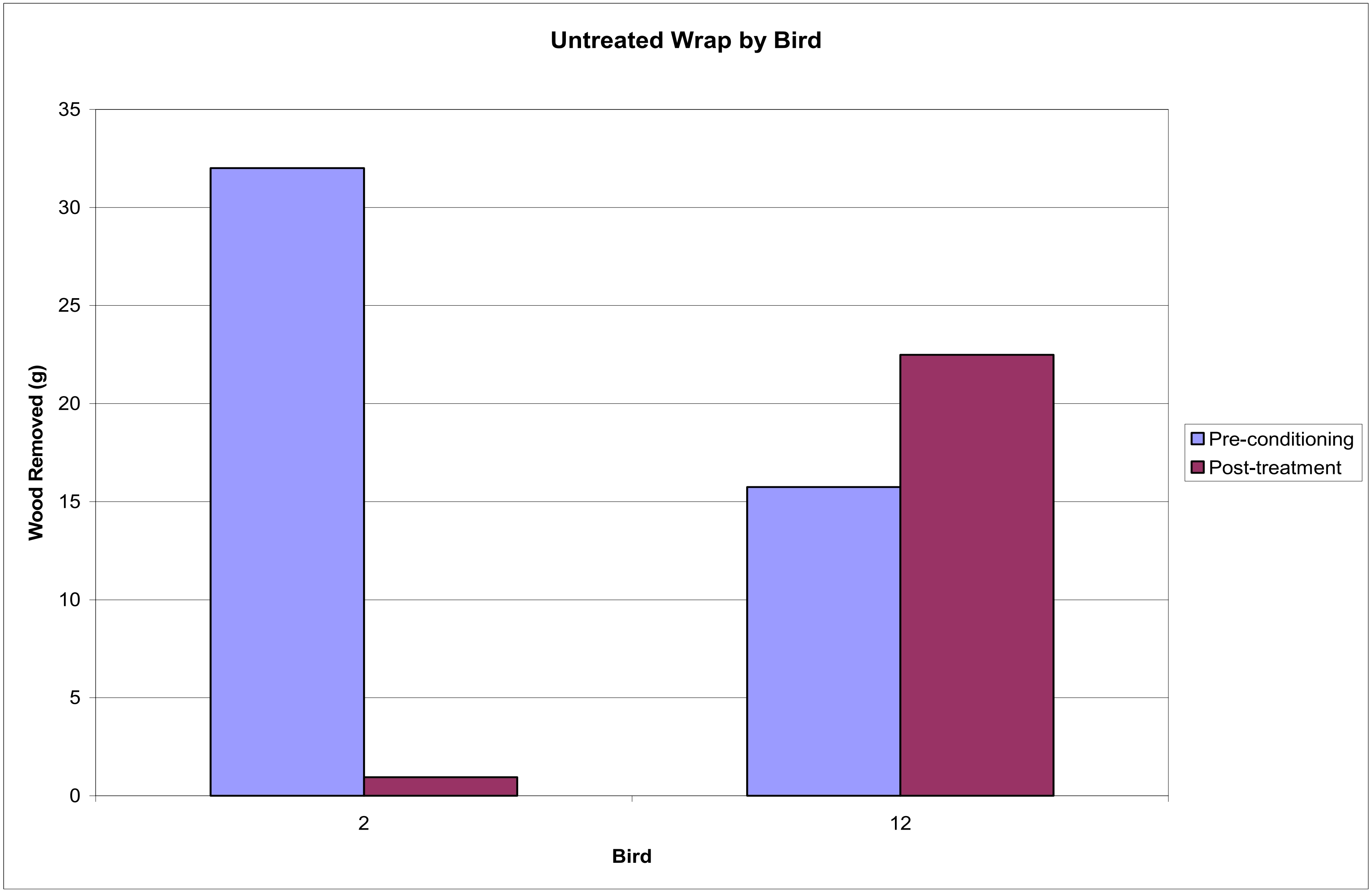

Figure 20: Mean daily amount of wood removed during the pre-conditioning and post-treatment periods for the birds exposed to the untreated wrap treatment.

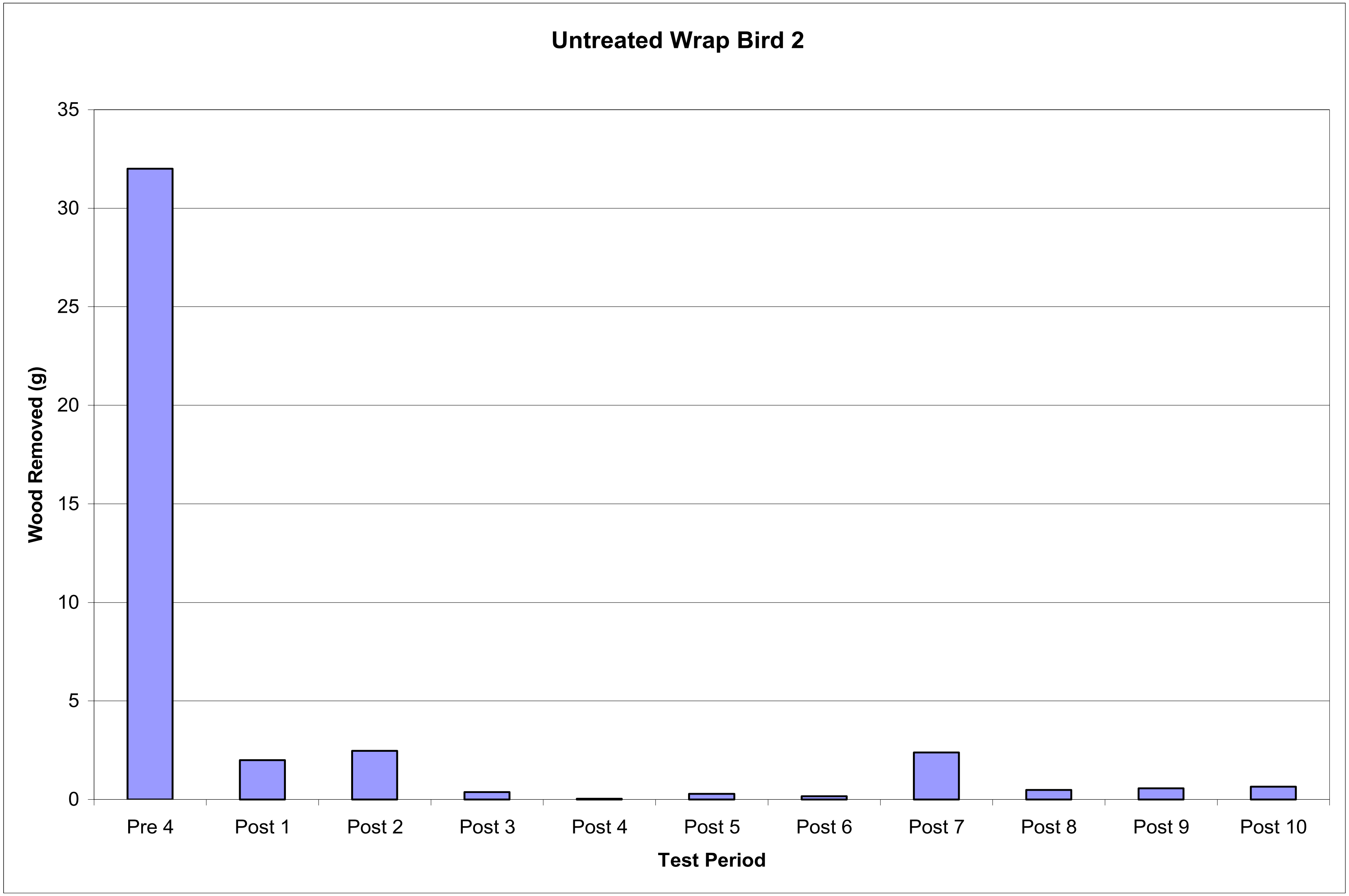

Figure 21: Daily amount of wood removed by pileated woodpecker in cage 2 from pole section with an untreated wrap.

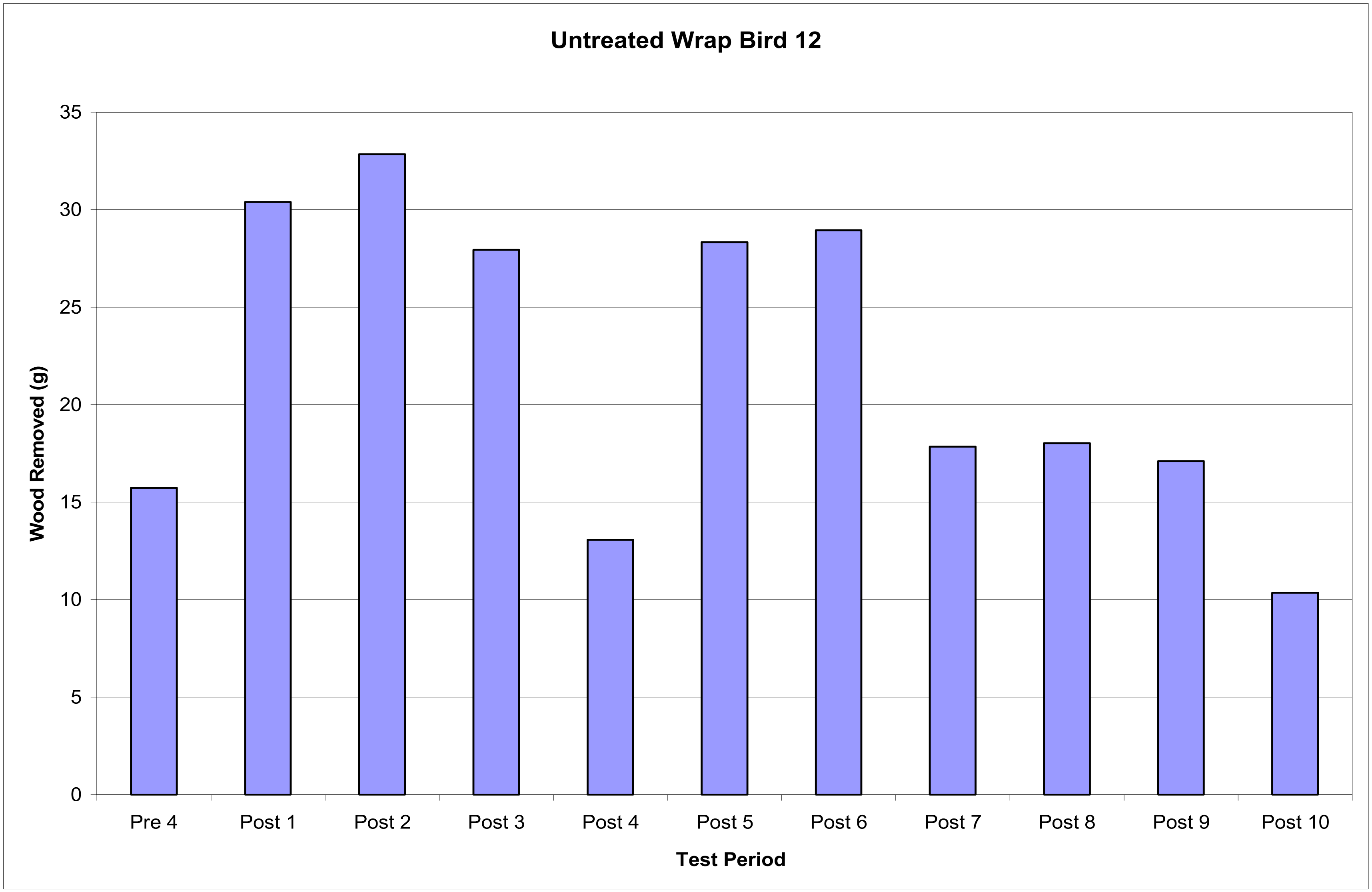

Figure 22: Pileated woodpecker from cage 12, daily damage (g) to the untreated wrap treatment pole. Amount of wood removed by pileated woodpecker in cage 12 from pole section with an untreated wrap.