Comparing
Tree Wound Closure

And other benefits

Treated Wounds vs. Un-treated Wounds

Abstract

While the use of Tree Wound Dressings have been demonstrated to be an effective means of helping prevent the spread of diseases such as Oak Wilt Disease, Dutch Elm Disease, Silver Leaf Disease, Black Knot, Stone Fruit Canker, Apple Canker, Apple Tree Fungus, Black Rot, Sapstreak Disease and Pitch Canker, we wanted to examine the effects of Tree Wound Dressing on wound closure. The results of our test show considerable improvement in closure on the wounds that were treated with Tree Wound Dressing. The improvement was due to a reduction of "die-back", rather than an increase in the rate of closure.

Treated Wound # 29

Un-Treated Wound #30

Both Wounds Are On the Same Tree, and Were Made At the Same Time!

There are three main reasons that people apply tree wound dressing to pruned or damaged trees, they are improved aesthetics, wound closure, and protection from the spread of disease. The issue of whether or not to apply Tree Wound Dressing to pruned or damaged trees has been examined for many years.

While the use of tree wound dressing is not a complete solution to controlling the spread of pathogens which can be spread by insects or airborne when trees are pruned or damaged, there is increasing evidence demonstrating that Tree Wound Dressings offer substantial protection from the spread of several airborne and insect carried plant pathogens. The application of tree wound dressing to pruned or damaged areas is widely recommended as part of a program to control the spread of Oak Wilt Disease. Most state and federal educational materials recommend the use of tree wound dressings as part of their Oak Wilt control program. In fact, the application of tree wound dressing is *mandatory* practice in some states, at certain times of the year, to help control the spread of Oak Wilt Disease.

Dutch Elm Disease, Silver Leaf Disease, Black Knot, Stone Fruit Canker, Apple Canker, Apple Tree Fungus, Black Rot, Sapstreak Disease and Pitch Canker are often spread in a similar fashion. While there is not as much evidence available on these diseases, it is reasonable to assume that the use of tree wound dressings would be equally effective as part of program to control the spread of these pathogens.

There is still the question of the value of Tree Wound Dressings when used to improve closure and/or reduce dieback levels when trees are pruned or accidentally damaged. This issue was examined by Dan Neely[1] in his study, "Healing of Wounds on Trees". Several different types of tree wound dressing were used in this study, including an asphalt emulsion wound dressing. While the results of this study showed nearly identical results for the wounds that were treated with asphalt emulsion as with the wounds that were left untreated, they did not use Treekote® tree wound dressing and we are uncertain of the ingredients in the asphalt emulsion dressing that was used.

In order to evaluate the benefit of using Treekote Tree Wound Dressing and tree wound dressings of similar composition for this purpose we decided to conduct a study to examine this issue using our Treekote® tree wound dressing.

Materials and Methods

Ideally it would be best to conduct the test on pruned trees, since this is a more common use of Tree Wound Dressings; however it is nearly impossible to conduct a proper comparison on pruned trees for many reasons. It is nearly impossible to find subject trees with two equal size branches at approximately equal levels on the same tree. Using different trees for comparison would have resulted in too many variables such as: genetic variation, the amount of sunlight, water, nutrition and overall health of the tree to make an accurate comparison.

Therefore we decided to deliberately wound the study trees. On each tree, two holes were drilled through the outer bark, the inner bark and the cambium layer and stopping before significantly damaging the sapwood with an auger type drill bit (6.515 cm diameter) at approximately the same height. This provided us with an equal base for our test.

We began our testing in November of 2007 by wounding 10 trees (red maples) with the bit as described. On each tree, one of the wounds was treated with a thin **(see comment)* coating of Treekote® Tree Wound Dressing (50% +/- Asphalt, 38% +/-Water, 8% +/-Hydrous Aluminum Silicates, 3% +/-Methanol, and 1% +/- Acetic Acid), and the other wound was left un-treated.

In order to expand the data base, in March of 2008 we performed the same action on 12 additional (red maples) trees.

During the wounding stage, some of the wounds resulted in additional damage, such as a tearing, chipping or lifting of the bark. When this occurred, the subject tree was treated with Treekote® Tree Wound Dressing but not used for the test.

In April of 2009 we photographed and measured the subject wounds at the widest horizontal wound width and the longest vertical wound length. Three patterns emerged after the first measurements.

The first was that, as expected, individual trees demonstrated very different responses to the wounds.

The second was that on all wounds, both treated and un-treated, vertical die-back was much greater than horizontal die-back.

The third pattern was that the trees that were wounded in November had far less die-back than the trees that were wounded in March. This pattern was a surprise to us since the study was conducted in Vermont, and the trees were in a dormant stage during both times of the wounding.

While they are interesting, these patterns are not related to our goal, which was to compare the closure rate of wounds that were treated with Treekote® Tree Wound Dressing and wounds that were left un-treated.

Results

We first examined the data on the trees that were wounded in November of 2007.

When measured in April 2009, 19 out of the 20 wounds demonstrated some horizontal closure. Only 1, untreated wound (#32) demonstrated horizontal dieback. This pattern was repeated when measured again in June of 2009, and by August 2009, all of the wounds demonstrated at least some horizontal closure.

We then examined the vertical closure, where the study wounds demonstrated much different response. Only one of the vertical measurements, treated wound # 25, demonstrated any vertical closure. This pattern was repeated in the June measurement. In the third measurement, taken in August 2009, there were 3 wounds, treated wounds # 25, 33, and 39 that demonstrated at least some vertical closure.

At this point the die-back on some of the wounds was making accurate measurements difficult, so no additional measurements were taken until the trees were harvested in December of 2010 and measured in January of 2011.

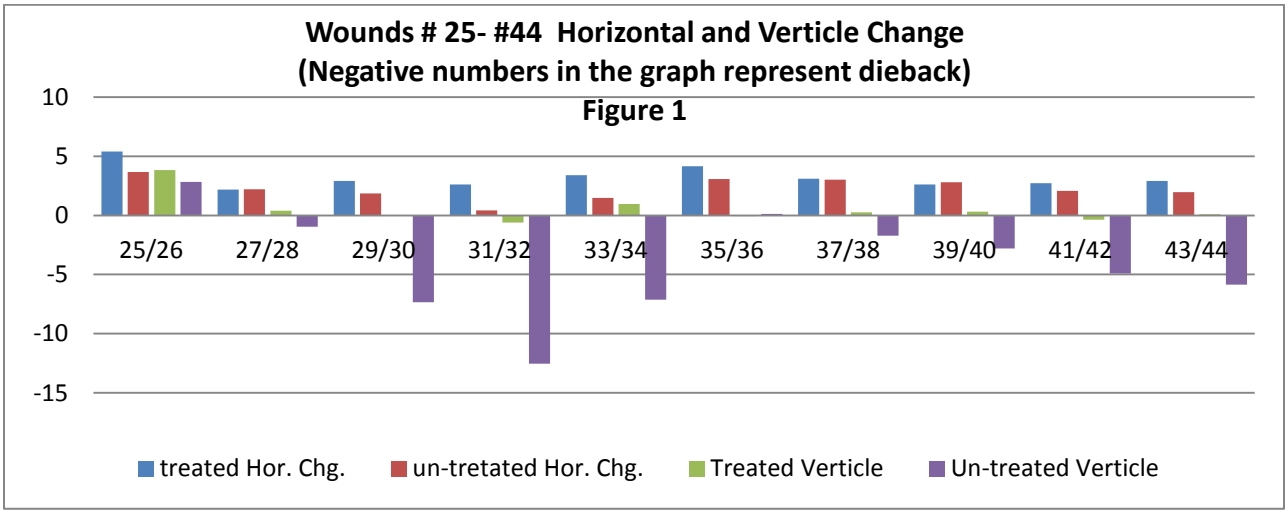
**Comment: In order to avoid the possibility of providing a "host" environment for insects and/or fungi, which have previously been associated with Tree Wound Dressings, Treekote® Tree Wound Dressing should be applied in as thin a layer as possible, while still completely covering the wound.*

When the data from the final measurements was examined, it showed that all of the wounds demonstrated some horizontal closure. Of the 10 trees that were wounded in November, 8 of the 10 wounds that were treated with Treekote® had a greater amount of horizontal closure than the un-treated wound on the same tree. The amount of horizontal closure on the treated wounds ranged from a low of -2.175cm or -33% to a high of -5.411cm or -83% with an average closure of -3.19cm or -49.1%. The amount of horizontal closure on the untreated wounds ranged from a

low of -.409cm or -6% to a high of -3.671cm or -56% with an average closure of -2.25cm or -34.5%.

In the same group of trees, only 7 out of 20 wounds demonstrated vertical closure. Of the wounds that demonstrated vertical closure, 6 of the 7 were wounds that had been treated with Treekote® Tree Wound Dressing. The amount of vertical closure on the treated wounds ranged from a low of +0.612cm or +9% to a high of -3.818 or -59% with an average closure of -.47cm or -7.6%. The amount of vertical closure on the untreated wounds ranged from a low of +12.535cm or +192%% to a high of -0.120cm or -2% with an average closure (enlargement) of +4.59cm or +70.4%.

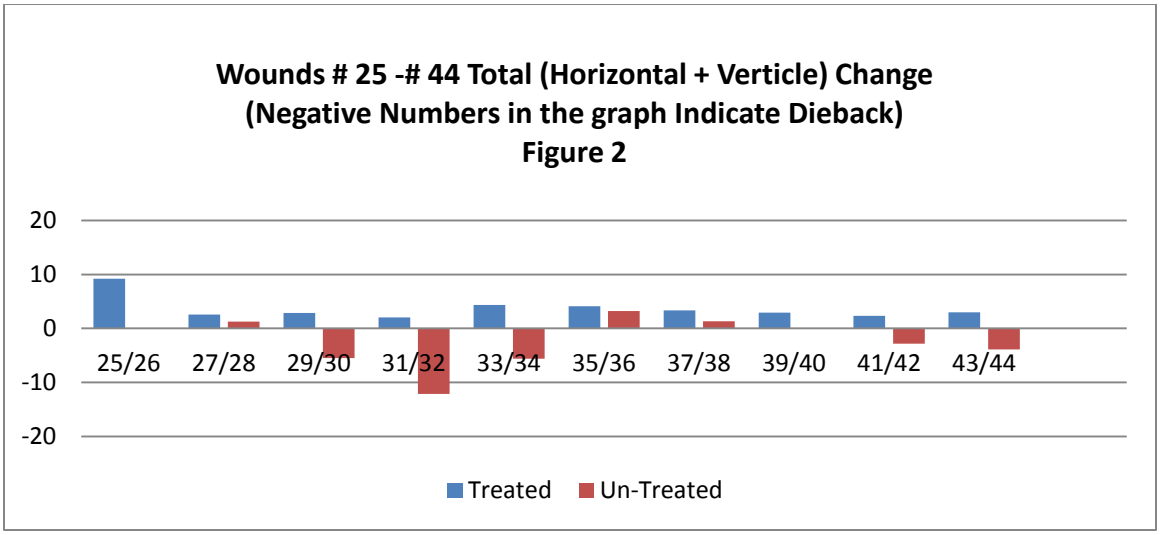
(See Figure 1)



Measurements are in centimeters

We then compared the amount of total closure and/or dieback (horizontal plus vertical) for each tree. This comparison demonstrated that on all of the trees, the wounds that were treated with Treekote® had a greater amount of total closure, or less dieback than the un-treated wounds. Furthermore, 10 out of 10 wounds that were treated with Treekote® tree wound dressing had a net reduction in wound dimension, while only 5 out of 10 un-treated wounds demonstrated any net reduction. The treated wounds had a total closure -36.747cm, while the un-treated wounds had a total enlargement of +23.337cm.

(See Figure 2)



Measurements are in centimeters

Next, we examined the data on the trees that were wounded in March of 2008. It should be noted that when the trees were harvested in December 2010, one of the trees (tags #21 and #22) was damaged, making accurate measurement impossible. This tree was therefore eliminated from the study.

When measured in April 2009, only 11 (7 treated and 4 un-treated) out of the 22 wounds demonstrated some horizontal closure, the remaining 11 wounds demonstrated horizontal dieback. This pattern was repeated when measured again in June of 2009, however there were now 12 (7 treated and 5 un-treated) demonstrating some horizontal closure with the remaining 8 wounds still demonstrating die-back and by August 2009, 19 of the 22 wounds demonstrated at least some horizontal closure with only 3 (1 treated and 2 un-treated) still demonstrating dieback.

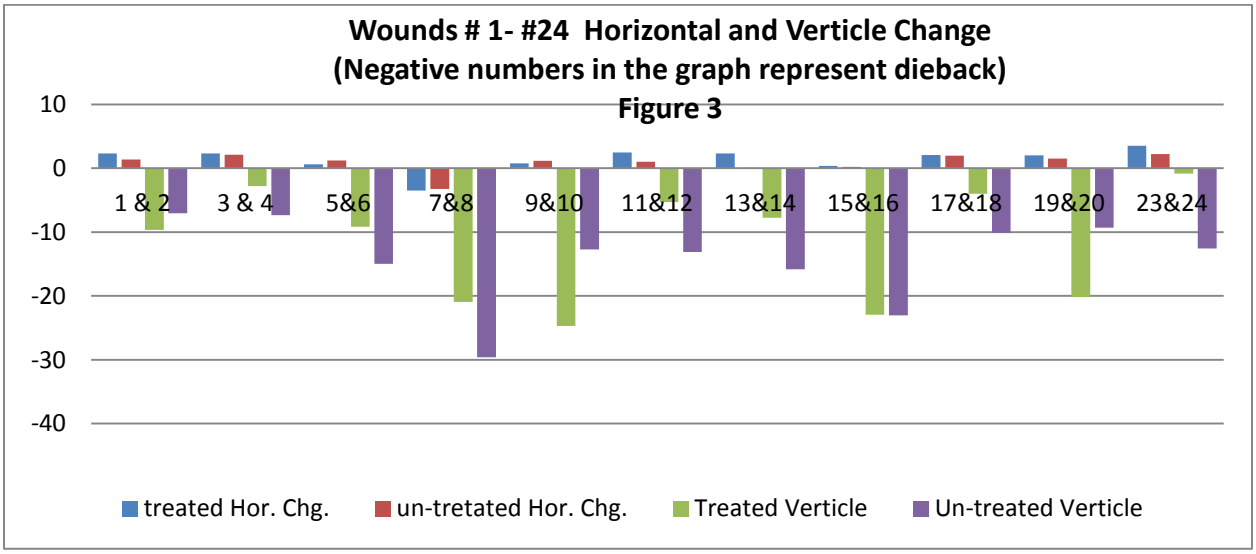
We then examined the vertical closure, which again demonstrated much different results than the horizontal closure. None of the vertical measurements demonstrated any vertical closure in the April 2009 measurements. This pattern was repeated in the June measurement, and again in the third measurement, taken in August 2009.

At this point, as with the trees wounded in March, the die-back was making accurate measurements on some of the test trees difficult, so no additional measurements were taken until the trees were harvested in December of 2010 and measured in January of 2011.

When the data from the final measurements was examined it demonstrated that, just as in the previous measurement, 19 of the 22 wounds demonstrated some horizontal closure, while 3 (1 treated and 2 un-treated) still demonstrated dieback. Of these 11 trees, 8 of the 11 wounds that were treated with Treekote® had a greater amount of horizontal closure than the un-treated wound on the same tree. The amount of horizontal closure on the treated wounds ranged from a low of +3.505cm or +54% to a high of -3.536cm or -54% with an average closure of -1.39cm or -21.27%. The amount of horizontal closure on the untreated wounds ranged from a low of +3.218cm or +49% to a high of -2.218cm or -34% with an average closure of -0.88cm or -13.54%.

We then examined the vertical closure, which again demonstrated much different response than the horizontal response. None of the trees demonstrated any vertical closure and several demonstrated what we considered severe vertical die-back. While all of the trees demonstrated vertical die-back, 8 of the 11 trees demonstrated less die-back on the wounds that were treated with Treekote® than with the un-treated wounds. The amount of vertical enlargement on the treated wounds ranged from a high of +24.709cm or +379%% to a low of +0.82cm or +13% with an average enlargement of +12.25cm or +179%. The amount of vertical enlargement on the untreated wounds ranged from a high of +29.603cm or +454% to a low of +7.075cm or +109% with an average enlargement of +14.15cm or +217%.

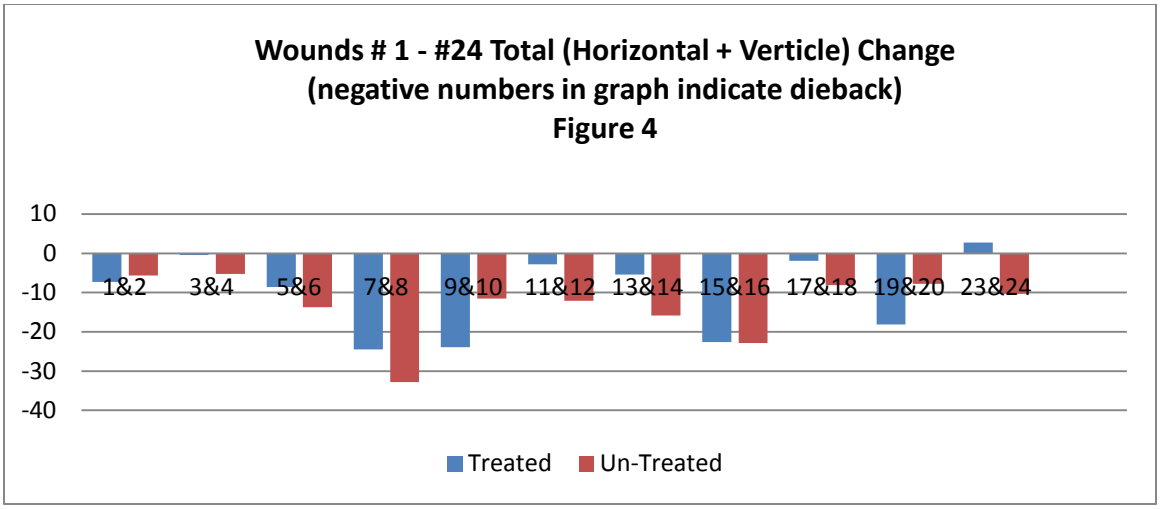
(See Figure 3)



Measurements are in centimeters

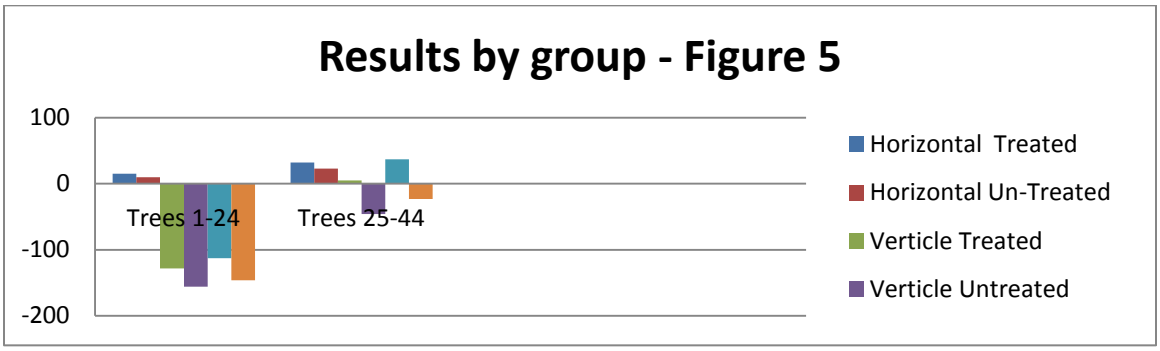
Finally we compared the amount of total closure, and/or dieback (horizontal plus vertical) for each tree. This comparison demonstrated a far different response than the trees that were wounded in November. Only 1 (treated #23) of the 22 wounds demonstrated any *net* total closure. However, 8 of the 11 wounds that were treated with Treekote® had less die-back than the un-treated wounds. The treated wounds had a total enlargement of +112.986cm, while the un-treated wounds had a total enlargement of +146.068cm.

(Figure 4)



Measurements are in centimeters

We also examined the results of the study by separating the trees that were wounded in November (numbered 25-44) and those that were wounded in March (numbered 1-24). We found that the wounds that were treated with Treekote® demonstrated an increase in closure or less dieback than the wounds that were not treated. Both the early measurements and the final measurements demonstrate the benefits of using Tree Wound Dressing. When examined by group, the test wounds that were treated with Treekote® on the trees that were wounded in March of 2008 (wounds 1-24) demonstrated 22.65% better total closure (horizontal plus vertical) than the un-treated wounds from the same group. Again, when examined as a group, the test wounds that were treated with Treekote® on the trees that were wounded in November of 2007 (wounds 25-44) demonstrated 257.46% better total closure (horizontal plus vertical) than the un-treated wounds from the same group. (Figure5)



Measurements are in centimeters

During the field measurements, it was noted that on many of the trees that had extensive vertical dieback, there were many types of insects infesting the compartment that resulted from the bark overlapping the area of dieback. While our study did not attempt to identify the insects or analyze the effects of the infestation the implications are that this cannot be beneficial to the tree.

Our study also indicated that wound response was better for this variety of tree, in this area of the country, in the fall, but other research has shown that the best response time, or time to prune varies with different species and different geographical areas.

Discussion

When pruning, it is very important to always use proper pruning methods, including sharp, clean tools and proper cutting methods.

While Treekote® Tree Wound does not contain any ingredients that stimulate tree wound closure, and we are not aware of any tree wound dressings that actually do stimulate wound closure, the results of our study have clearly demonstrated that treating tree wounds with Treekote® Tree Wound dressing resulted in reduced levels of dieback, which led to increased wound closure when directly compared with wounds that were left untreated. It should be pointed out that while our test used Treekote® Tree Wound Dressing, many asphalt emulsion Tree Wound Dressings are virtually the same in composition. Therefore we would expect similar beneficial results from other asphalt emulsion Tree Wound Dressings.

Two well known studies, Shigo and Wilson[2] and Shigo and Shortle[3] also demonstrated less area of dieback on wounds that were treated with Treekote® tree wound dressing than wounds that were left untreated, although by minor amounts. The Dan Neely[1] study showed virtually the same amount of "Healing" for the treated wounds compared to the wounds that were left untreated, but in his conclusion he cites several prior studies that found that tree wound dressings may prevent dieback.

There is also the question of whether tree wound dressings can actually be harmful to trees. Probably the best known studies on tree wound dressings are "Wound Dressings on Red Maple and American Elm: Effectiveness after five years" (Shigo and Wilson[2]) and "Wound Dressings: Results of studies over 13 years" (Shigo and Shortle[3]). While both of these studies examined several different tree wound dressings they both included Treekote® tree wound dressing. Both studies identified several types of wound dressings that had negative results and concluded that tree wound dressings were of "no value"(Shigo and Wilson[2] 1977) and "there is no need for a dressing"(Shigo and Shortle[3],1983). We focused our review of these studies on the wounds that were treated with Treekote®. The Shigo and Shortle[3] study published in 1983 which states that "there is no need for a dressing" demonstrated that the wounds that were treated with Treekote® actually had a lower occurrence of decay fungi than untreated wounds, had a lower area of discolored wood (indication of decay) than untreated wounds and had a smaller area of dieback than the untreated wounds. The Shigo and Wilson[2] study of 1977 showed similar levels of vertical extension of discolored and decayed wood and similar amounts of closure. This study also used electrical resistance in an attempt to identify decayed wood. This test did show higher resistance on the untreated (control) wounds than the treated wounds, an indication that the treated wounds had more decayed wood. The author's state: "This is possible because the coating serves to hold moisture in the wound. The small cracks around the margin of the wood and the cambial dieback were courts for wood-inhabiting microorganisms, and the dressing protected them, and kept moisture in."

While we do not dispute this theory, we would point out that when applied properly, in as thin a coating as possible while still achieving coverage, the development of "courts for wood – inhabiting microorganisms" would not occur.

Furthermore, Shigo's follow up study, published in 1983 showed lower levels of "decay fungi" and less area of discolored wood (an indication of decay) in wounds that were treated with Treekote® tree wound dressing than the untreated wounds

Conclusion

The practice of applying Tree Wound Dressings to pruned or damaged trees, as part of a program to help control or prevent the spread of several plant pathogens is widely recommended. The results of this study, demonstrate that the use of Treekote® Tree Wound Dressing produced a reduction in the amount of dieback, resulting in increased closure at the wounded areas. Additional studies have also demonstrated less dieback and/or increased closure. Most importantly, NO studies that we are aware of have demonstrated that asphalt emulsion tree wound dressing, of similar composition to Treekote®, have resulted in greater area of dieback or less closure than un-treated wounds.

Even the studies by probably the best known critic of tree wound dressing demonstrated that using Treekote® tree wound dressing resulted in better closure (less dieback), less decay fungi, and a lower area of discolored wood than the wounds that were left untreated. While the 1977 Shigo and Wilson[2] study theorized that "*the small cracks around the margin of the wound and the cambial dieback were infection courts",* if asphalt emulsion tree wound dressing is applied properly, in a thin coat, this phenomenon will not develop.

Tree Wound Dressings also provide an aesthetic value, giving pruning/trimming work a "finished" look.

When you weigh all of the evidence, the choice is clear. Arborists, Orchardists, and homeowners should always immediately apply a quality tree wound dressing after pruning or when trees are accidentally damaged.

No Decrease in dieback
No Decrease in harmful Fungi
No Protection from the spread of harmful plant pathogens

Decrease in dieback
Decrease in harmful fungi
Protection from the spread of harmful plant pathogens

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References

[1]Neely, D. 1970. Healing of wounds on trees. Journal of the American Society for Horticultural Science 95:536-540.

[2]Shigo, A.L. and C.L. Wilson. 1977. Wound dressings on red maple and American elm: Effectiveness after five years. Journal of Arboriculture 3:81-87

[3]Shigo, A.L. and W.C. Shortle, 1983. Wound dressings: Results of studies over 13 years. Journal of Arboriculture 9:317-329