Trunk Splitting Explained

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The Symptom:

Under certain climatic conditions, a small percentage of Fraser fir Christmas trees will develop cracks vertically along their trunks. These cracks usually begin at the cut base and extend up one side of the trunk. In rare cases, the split extends through the base of the trunk, dissecting it in two pieces. Splits have also been reported higher up on one side of the trunk without extending down to the base. All of these cracks develop in the wood. The bark may remain intact with small cracks, but will split with larger cracks. Split trunks can develop in the field after the trees are cut, in storage on the farm, during transportation, in the retail lot, or in a consumer's home.

Is it a Problem?

A crack in the trunk of a Christmas tree may raise concerns regarding product quality or perhaps even fire safety. Most concerns related to trunk splitting can be put to rest. This is a problem of fresh trees that lose part of their moisture too rapidly. Given a fresh cut off the base of the trunk and placed in water, trees with cracks will take up water normally for the entire holiday season. In many cases, the cracks will close up as trees are re-hydrated. Cracks are not directly related to foliage freshness, a tree's ability to take up water, or fire safety.

A crack can be a tree stand problem, however. In some cases the pre-drilled pin tree stand may not work and a different style be needed. Where the rare tree is split across the base, no stand may hold it firmly. Some retailers have clamped or screwed cracks closed quite effectively. Since wood and not the bark of the tree take up water, such techniques should not reduce a tree's ability to absorb water. While trunk splitting can clearly be a customer relations concern, it seldom is a functional problem for effected trees.

The Mechanism:

Split trunks occur in fresh trees that lose moisture rapidly over a relatively short period of time. While the development of cracks is related to the shrinkage of drying wood, the concept of shrinkage fails to capture the occurrence of cracks in fresh trees with high moisture content.

The primary force involved in split trunks is the capillary tension of the water in the cell walls of the wood. Capillary tension is the force that holds liquid in small tubes such as a glass thermometer. As moisture is lost from foliage of a cut tree, the remaining water in the wood is still stretched from foliage to trunk by capillary tension. This increases the inward pull of the water in the tree trunk – much like a vacuum in a soaked container – and increases the force on each vessel in the wood.

When the force of capillary tension exceeds the internal strength of the wood a crack develops. The tensile strength of Fraser fir wood is only about 180 psi. The forces involved in capillary tension have been measured as high as 515 psi—much greater than the strength of the wood. When the cell wall of one vessel collapses, integrity is lost, more cells collapse, and the crack splits open.

Contributing Factors:

Trunk splitting is a function of rapid moisture loss from cut trees. Cut trees can lose some moisture from the cut end of their trunks, but lose most from the foliage as it respires or breathes. The rate at which tree foliage respires is closely linked to climatic conditions and tree dormancy.

Full sun, high temperature, and dry winds can pull moisture from the foliage of cut trees. While drought may be a contributing factor to the stresses that initiate cracks, the primary factor is exposure to conditions that dry the tree out rapidly. Cracks can develop the day after a rain if newly cut trees are subjected to drying

conditions. Cracks have occurred in cold temperatures accompanied by dry winds, but exposure to bright sun and temperatures above 70 degrees are the conditions most likely to result in split trunks. Cracks will develop during a period of severe exposure whether it occurs in the field, in storage, during transportation, or on the retail lot.

In a normal fall season, Christmas trees experience enough cold temperatures to go dormant before tree harvest begins. Dormant trees shut down for the winter. Their stomates, the openings on the undersides of needles, do not open as much. Respiration slows. Less air is exchanged and less moisture is lost than if the trees were actively growing. Dormant trees can be exposed to drying conditions and not lose much water. Dormant trees are less likely to develop cracks in their trunks.

If fall temperatures remain warm with few nights below freezing trees will fail to achieve dormancy. Trees will still be actively respiring and have minimal defense against drying conditions. This influences all aspects of tree freshness, not just formation of cracks in the trunk. Needleshed and stringburn are also more likely in trees that have not undergone the physical changes of dormancy. In short, if autumn is unusually warm, extra measures will be needed to maintain tree freshness.

Recommendations:

Since trunks can split during any period of exposure during harvest or the retail season, all handlers must share in the responsibility for tree care.

Growers should:

- Delay harvest as late as possible to allow trees to achieve maximum dormancy.
- Limit cutting in the middle of very hot days to minimize exposure of unbaled trees.
- Transport trees from fields to storage areas as quickly as possible to avoid excessive exposure to sun, heat, and wind. This is very important when trees are cut during sunny, warm weather.
- Store trees upright with trunks in contact with the ground in a cool, dark, and moist location. Use a natural pine stand or a shade cloth structure with wet mulch on the ground. If the ground is wet, the trunks can take up water.
- Irrigate storage areas with fine mists to increase relative humidity and reduce temperatures through evaporation (a fine mist will evaporate and cool more rapidly than heavy irrigation).
- Ship trees in refrigerated trucks or at night, particularly to Southern destinations. Trees in un-refrigerated or tarped trailers can be scalded by high temperatures.
- Consider using temperature and humidity monitors in trucks to document shipping conditions.

Retailers should:

- Build a storage area prior to trees delivery that is cool, dark, and provides some means of watering the trees. Delivered trees should be stored immediately to minimize exposure.
- Display trees with some means of irrigation such as a wet mulch or watered sod, or preferably use tree stands with water reservoirs. Misting displayed trees with water can cool them down and slow drying.
- Consider putting up a tent or other shade structure to protect displayed trees or relocate to a naturally shaded by mature trees.
- Consider clamping or screwing closed any trunk splits that occur
- Cut a ½ to 1 inch disk off the trunk to improve water uptake prior to display in water or sale to a consumer
- Educate consumers regarding care and safety of fresh cut Christmas trees.