The night the trees died...

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November 12, 2011 - the night of the mountain wave tempest in the Sangre de Cristo Mountains that left thousands of large trees uprooted, denuded of most branches, or broken off.

The entire day was windy with sustained winds of 20-30 mph and gusts to 40-60 mph. In the evening the wind was calm, but about 9 p.m. it increased, and by 1:00 a.m. sustained winds were estimated at 60-80 mph and estimated gusts reached over 100 mph.

The intense part of the wave event lasted about six hours and killed or injured thousands of large trees on the eastern slopes of the mountains from Trinidad to Buena Vista.

Mountain wave events translate into windstorms and have been studied on the eastern slopes of the Rockies in high wind areas including Boulder, Fort Collins and Westcliffe in Colorado.

Paul Wolyn and Thomas Magnuson of NOAA/NWSFO in Pueblo published data on high wind events in the Sangre de Cristo Mountains and Wet Mountain Valley on Dec. 5, 2001 and January 20, 2002. The December event had measured gusts of 90 mph. The Nov. 12, 2011 storm gusts were stronger.

Mother Nature thinned the canopy trees that night - most trees that blew down or broke off were large trees that had withstood 100 years or more of storms..

The wind did not discriminate among species - ponderosa pine, Douglas fir, white fir, subalpine fir, blue spruce, Engelmann spruce and aspen all suffered from this event.

In the aftermath of the storm examination of the carcasses showed that trees eliminated not only included those with prior trunk defects from previous windstorms or wounds, often with decay further weakening the wood, trees with extra large crowns because of forked tops or very old, large limbs, but also many with what appeared to be very healthy wood.

Perhaps 100+ mph winds were just too much.

The valley bottoms were hit the hardest with trees falling down like dominoes- the tallest trees and the wettest soils combined to create a scene that looked like a war zone.

Woe to those who had (note past tense) a “little cabin in the woods”. If the cabin was surrounded by tall trees, especially in a valley bottom m area, there was often heavy or irreparable damage to buildings.

Somepeople had created defensible space for fire, but neglected to create space for windfall.

Out in the Wet Mountain Valley the wind toppled cottonwood trees.

Fortunately the winds were weaker in Westcliffe and on the east side of the valley in the Wet Mountains, but the downslope side of the Sangre De Cristo, with its many subdivisions bordering the National Forest, saw a huge loss of trees in the 100-160+ year old age classes.

Upper Right: Only one tall tree left standing n this view across Greenleaf Creek. Nearly tall tree on the slopes and in the valley bottom either toppled or lost its crown. The hilltop in the distance appears to have lost half of the canopy trees. Above: Leaning trees which will probably fall in a future wind event. Right: A windy ridge of Horn Creek Camp where Ponderosas already weakened by Dwarf Mistletoe infection lost branches and trunks fro windshear.

The cumulative effects of multiple smaller windstorms, parasites, drought and the action of bacteria and fungi on wind-damaged trees reached a zenith in the Nov. 12 windstorm.

High winds can cause internal damage to tree trunks

Wandering around Ground Zero after the windstorm revealed all possible ways that trees can be killed or damaged by wind.

Total uprooting, roots broken off underground with the same result of total windthrow, trunks broken off at the base or somewhere higher - all the way to the top (twisted crown) - with or without evidence of rotten or weakened wood, and branches stripped off from the wind itself or shearing off as adjacent trees fell.

Many trees "hung up" on other trees and are now dangerous "leaners" - waiting for the next windstorm to allow them to fall, or waiting until the trunks rot and weaken and the tree collapses.

The internal damage to tree trunks cause by high wind events is hard to discern by observing a standing tree.

Often physical damage (vertical or horizontal cracks in the trunk wood) may be vsible when the trunk snaps off, or the tree is cut and subsequently milled into lumber.

This makes splitting firewood logs easier, but can render parts of a large tree useless of lumber milling because of the size and pervasiveness of the cracks.

Cracks can range from microscopic to large, old cracks from storms years ago weakened the trees that fell, just as this storm has likely cause damage within trees that are still standing after this even.

Forestry vernacular for cracking due to wind, and often made worse over time by bacterial rot, is called "Windshake".

Windshake can result in several patterns in the heartwood and sapwood - cracks can be vertical (along the edges of the rings this is called ringshake or cupshake where it is near the bottom of the tree), or horizontal (across the rigs and may be called heartshake, star shake or radial shake). Vertical or horizontal shake patterns can be long or short. Initial physical windshake cracks can be filled in with pitch or can develop bacterial infections causing the wood to rot and become weak over time and as a result of multiple events.

There can be a crack all the way around a given ring, separating the heartwood into an inner core and an outer core (ringshake) , or there can be multiple "cupshake" failures where the rings separate for some given vertical distance in multiple places within the trunk. This leads to the common shattered pattern seen when the trunk breaks.

Often there is damage from both vertical ring separation and horizontal cracking of the heartwood and sapwood (windshake), resulting in significant weakening of the trunk when the tree is stressed by high wind.

So how did the Ponderosa pines do in this? In the Sangre de Cristo Mountains Ponderosas generally grow on south facing slopes or flat benches away from wet areas. They are in very exposed positions o the south facing slopes.

Ponderosas were observed to uproot and be thrown, fall because roots broke off, and many had damage to the crown or large branches that twisted or tore off.

Observation of all areas from the valley to hilltops revealed a few old snags or stumps from past similar events, but few large cavities caused from widespread uprooting and windthrow as this event caused.

At least in this particular location, below Gibbs Peak, it appears that it has been a very long time since a wind event of tis magnitude affected a mature forest.

It will be interesting to see how scientists classify this event after it has received some in-depth study beyond the anecdotal treatment in their article, but it certainly appears that this was an extreme event, and one that might occur just a few times every thousand years.

Above: This cabin along the creek was tightly surrounded by 90' trees located in an excellent growing site, but also where roots were in wet alluvium. Miraculously the cabin escaped major damage and the fallen trees missed the propane tank but there were three large trees on the deck and several others either leaning on trees that did not fall or leaning on the cabin itself. Upper Left: Although the tree looked large and healthy, the trunk midsection had advanced heartrot, and ringshake, indicated by vertical gaps between rings appearing as dark k]=lense-shaped hoes, and also has windshake radial cracks running form the center toward Lower left: Enormous roots on the windward side of this douglas fir failed and the tree toppled Lower right: This ponderosa had butt rot and snapped at the base of the trunk about the roots.