

## Information Sharing Between States

WSDOT has been contacting other states in an effort to learn more about needle browning.

- Have other states experienced the same phenomenon?
- Has anyone researched the issue?
- If so, what are the conclusions based on the findings?

Of the states responding, most had not experienced or researched needle browning. However, some states indicated that they had researched needle browning and pointed us to other studies on the topic.



Pine trees adjacent to a mountain pass highway in Montana showing similar browning pattern.



Needle browning occurring along side new growth on US 97 Blewett Pass.

Responses indicate that this phenomenon is more pronounced along the East Coast and in the Midwest where winters are typically much more severe. The consistent theme of these responses is that there seems to be a wide range of causes for needle browning. In addition to needle browning, these states are also experiencing tree blight, insect infestation, cold temperature damage and drought, not associated with their winter snow and ice programs. These are similar issues we have identified in Northwest states.

Links to some of the research:

- Forest Insect and Disease Conditions in the United States 2000 – USDA  
[www.fs.fed.us/foresthealth/annual\\_i\\_d\\_conditions/land%20D%20report2000.pdf](http://www.fs.fed.us/foresthealth/annual_i_d_conditions/land%20D%20report2000.pdf)
- Effects of Deicing Salts on the Chloride Levels in Water and Soil Adjacent to Roadways (the Michigan study) – Michigan Department of Transportation  
[www.Michigan.gov/documents/mdot/MDOT\\_Research\\_Report\\_R1495\\_207577\\_7.pdf](http://www.Michigan.gov/documents/mdot/MDOT_Research_Report_R1495_207577_7.pdf)
- Effects of Chlorides on Vegetation – South Dakota Department of Transportation  
[www.state.sd.us/Applications/HR19ResearchProjects/oneproject\\_search.asp?projectnbr=SD2006-01](http://www.state.sd.us/Applications/HR19ResearchProjects/oneproject_search.asp?projectnbr=SD2006-01)
- Massachusetts Highway Department Snow & Ice Control Generic Environmental Impact Report – Massachusetts Highway Department  
[www.mhd.state.ma.us/downloads/projDev/geir06.pdf](http://www.mhd.state.ma.us/downloads/projDev/geir06.pdf)



These trees are dying because their water supply was choked off by a nearby beaver dam.

# Browning of Conifers Along Mountain Passes in the Northwest

October 2007



The Pacific Northwest states of Montana, Idaho, and Oregon which all have similar winter weather, vegetation, and terrain, report seeing the same needle phenomenon along mountain pass highways. We frequently share information about browning and are active partners in joint initiatives such as the Pacific Northwest Snowfighters (PNS) organization: [www.wsdot.wa.gov/partners/pns](http://www.wsdot.wa.gov/partners/pns)



## Needle Browning

Springtime travelers through Northwest mountain passes may have noticed brown needles on certain types of trees near the roadway edge. The browning pattern appeared on the trees through spring until new growth took over and green needles reemerged by summer.

The transportation departments of these Northwest states have observed this springtime phenomenon in the last three years and are looking for possible causes, including links to deicers used to control snow and ice. We know that winter maintenance activities certainly play a part. We're narrowing down the possible causes including the branch abrasion that happens when our snow plows propel sheets of snow and ice off the road as well as the affects of our deicer chemicals.

## For More Information

Doug Pierce  
WSDOT Maintenance  
360-705-7812  
[piercedl@wsdot.wa.gov](mailto:piercedl@wsdot.wa.gov)

## What We Know

Weather patterns over recent years including summer drought conditions and harsh winters have largely contributed to the trees showing significant wear and tear. If you look closely, brown branches and needles in coniferous trees along the right-of-way only appear on the branches facing the road and only appear on trees within the plow truck's snow "cast" or "splash" zone. Trees more than 40 or 50 feet from the highway aren't affected. The browning appears on the trees as the snow melts and by summer, needle re-growth becomes evident. This indicates that this condition is temporary and trees can and do overcome the effects of needle browning. We observed this cycle on US 97 through Satus Pass in South Central Washington (see photos below).



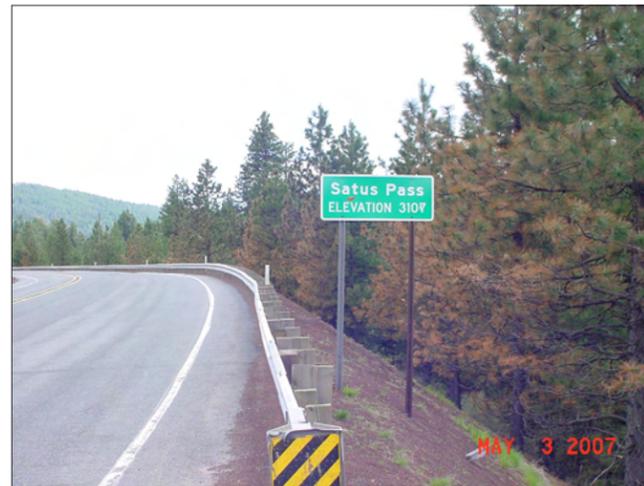
Close up of pine needles showing re-growth after the browning occurred.

## What We Are Learning

- Trees next to the road are subject to the abrasive effects of snow plows casting hard packed snow and slush onto them.
- Soil samples taken from the ground under these trees show little or no increase in chloride levels.
- Drought conditions during the summer months in combination with lengthy periods of extremely cold temperatures during the winters could also be having an affect on trees.
- The browning appears limited to conifers. Grasses and shrubs seem to be unaffected.
- Branches not facing the road appear unaffected.



Notable needle browning on US 97 on Blewett Pass in Washington State illustrates the distinct pattern area.



Browning pattern on US 97 through Satus Pass in early May 2007.



Regeneration of pine trees on US 97 in the same location through Satus Pass in early August 2007.

## What We Are Doing

### Testing Chloride Levels in Soil and Water

Our goal is to minimize chloride levels in the roadside environment. While mild winter weather helps with this goal, we are also implementing a variety of actions to minimize chloride loading while still delivering a high level of service for winter road conditions. This generally requires using the minimum amount of deicers that will most efficiently achieve and maintain safe winter road conditions.

Each winter season, roadside soil, surface water, or groundwater monitoring is conducted at various locations on the highway system. This monitoring has been an ongoing effort since 1999, and has ranged from academic research projects to less formal "before and after" winter season water sampling and testing.

We continue to find that chloride levels are well below regulatory guidelines or standards. For example, in a study of water quality in Peshastin Creek along US 97, the Blewett Pass Highway in Chelan County, the typical level of chlorides in the creek was between one and five parts per million (ppm). The standard for your drinking water is 250 ppm.

Sampling results over the past several years has never shown a chloride increase in drinking water wells near the highway. Several locations in mountain passes serve as sampling sites. Soil samples are taken prior to winter at the base of pine trees near the roadside. Other soil samples are taken 100 feet into the forest as a comparison. Post winter soil samples results are compared to those done prior to winter. With two winter seasons of sampling pine tree bases, no appreciable chloride build up has been found.

The Michigan Department of Transportation (MDOT) has also been sampling for chloride effects to soil, well water and surface water. In a recent study, MDOT presented their findings conducted over a period of 13 winters. Their results showed no appreciable build up of chloride in the surrounding environment. Annual precipitation, including melting snow provides adequate dilution to prevent build up.

WSDOT's approach is pro-active including:

- Increased monitoring at various locations along the highway to track chloride levels in the soil and water.
- Following local national and international research on needle browning and applying the lessons learned.
- Pre-treating roads in advance of freezing temperatures and snow events to minimize the amount of deicer needed.
- Training our operators in the best application practices and improving equipment calibration.
- Gathering and tracking data on application of deicer to reinforce sound decisions on material applications.



WSDOT employee taking soil samples near the roadway.

- Improving and expanding our weather forecasting information in order to make the best possible decisions on deicer applications.

### Consulting Experts and Other Agencies

Discussions about the problem are underway between WSDOT and other agencies including U.S. Forest Service, Department of Ecology and the State Department of Fish and Wildlife. A number of conversations and consultations with plant experts, including two forest pathologists with the US Forest Service revealed little concern over the long term health of the pine trees.

These scientists were well aware of the needle browning phenomenon and explained that in the scheme of all forest diseases, they had little concern over the browning. They view the browning as a temporary event. They note a more profound concern over chronic forest disease like bus worm, pine beetle and fungus which are filling northwest trees in great numbers. The US Forest Service is not studying the browning phenomenon and is not asking WSDOT to change its practices, because it is certain that the browning is not significantly affecting the overall health of the trees.



Example of pine tree in Washington killed by fungus.