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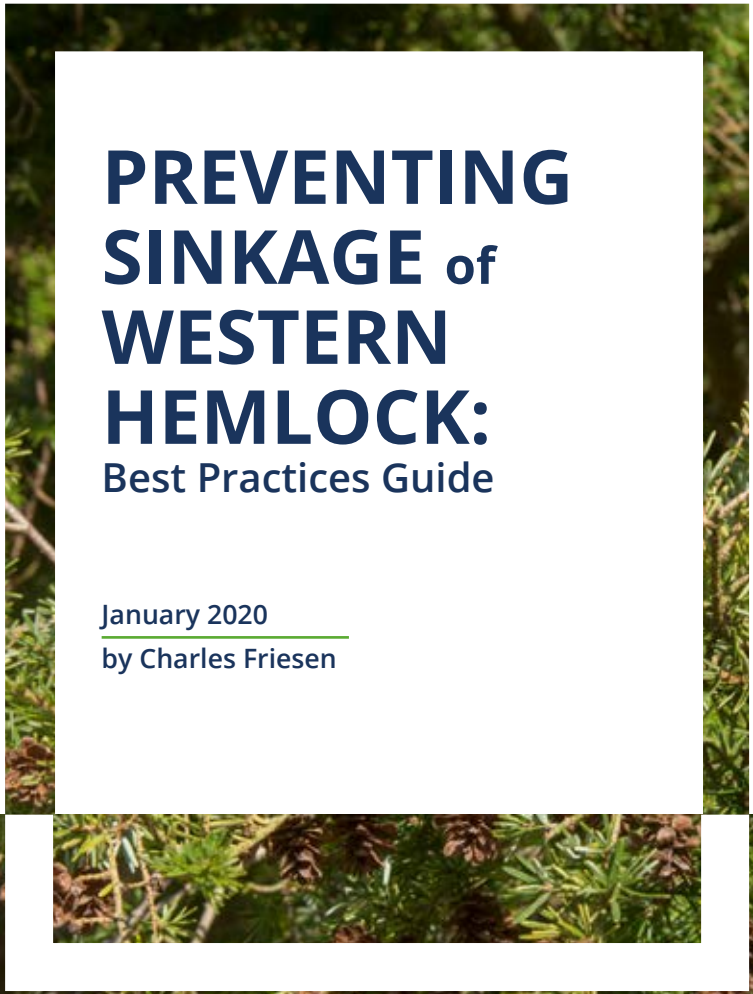
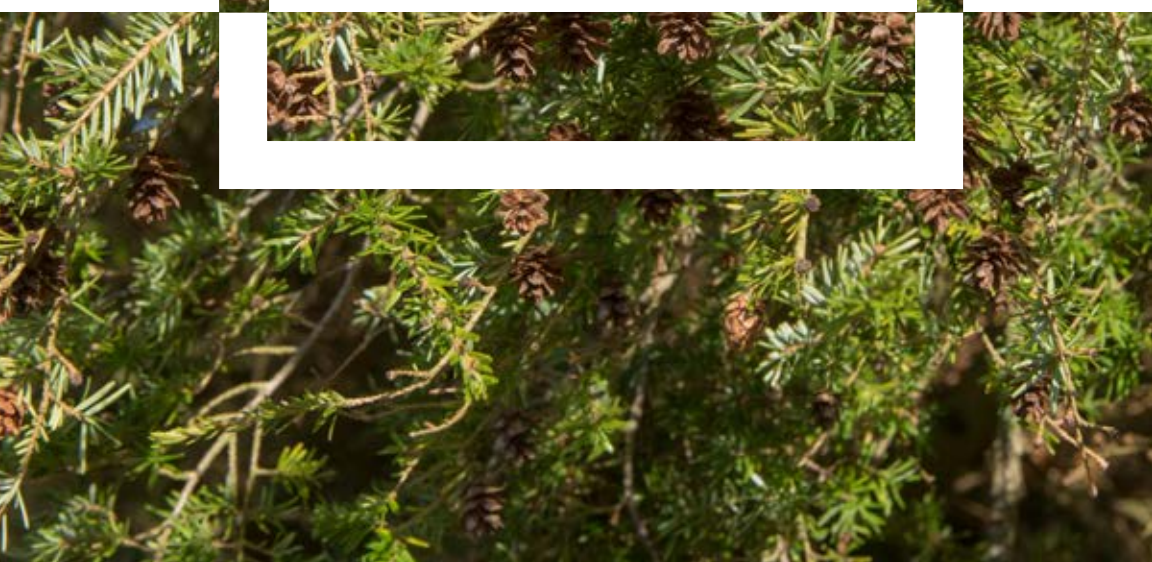


PREVENTING SINKAGE of WESTERN HEMLOCK:

Best Practices Guide

January 2020

by Charles Friesen



Preventing Sinkage of Western Hemlock: Best Practices Guide

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Western hemlock can have higher moisture content than most other native trees, which causes it to sink.

Hemlock lumens have large pits (valves) that allow easy transport of water into the wood.

Bigger rings = bigger lumens.

Younger hemlock or hemlock tops have large rings and are more susceptible to sinking. The bigger the rings, the more likely the hemlock is to take on water.

Critical moisture content for hemlock flotation is 53%.

Western hemlock has an average wood density of 0.450 kilograms/litre (kg/L). Hemlock stemwood density ranges from 0.400 to 0.450 kg/L, with an overall mean of 0.426 kg/L.[1]

Based on a wood density of 0.45 kg/L, hemlock will float in freshwater when it has a moisture content up to 55%, and in seawater at a moisture content up to 58%. Seawater contains dissolved salts, which makes it heavier than freshwater. For safety purposes, 53% is suggested as the threshold for sinking hemlock, especially in freshwater. Moisture content (MC) is calculated on the wet basis, where MC = (wet weight - dry weight)/wet weight.

Limiting factor	Density (kg/L)	Equivalent moisture content of western hemlock, average
Seawater	1.027	58%
Freshwater	1.000	55%
Low-floating	0.980	53%

Sample hemlock before it is watered.

If there is doubt about whether a batch of hemlock will float, it should be sampled before watering.

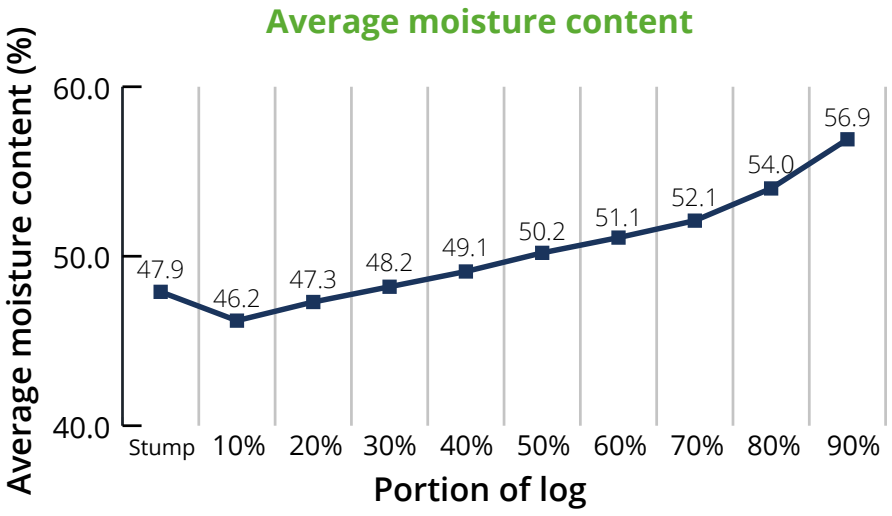
Critical hemlock moisture content is 53%.

Take 5–20 smart phone–size samples. Weigh the samples, dry them in an oven at 250°F, and weigh them again.

MC = (wet weight - dry weight)/wet weight.

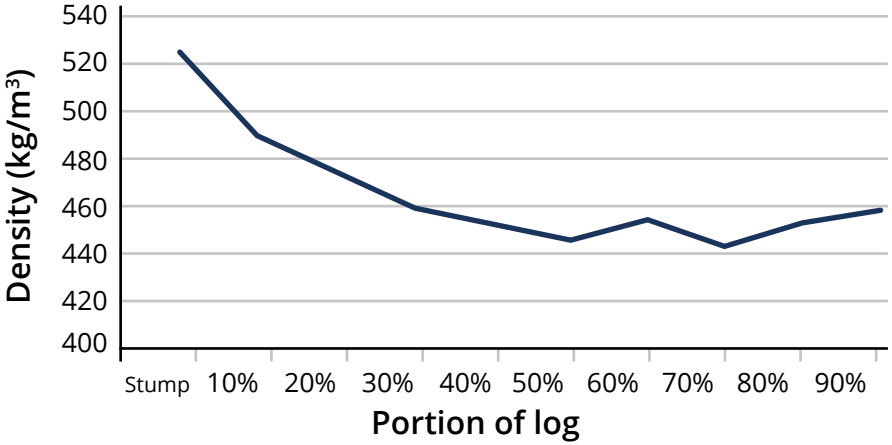
It is best not to sample from the very bottom of the tree, where moisture content may be atypical because of exposure.

Both moisture content and wood density vary along a hemlock stem.[2]



Moisture content tends to increase from the stump to the top of the stem because lumens are larger and can store more moisture where tree rings are wider. The large pits between hemlock lumens allow easy transport of water deep into the log.

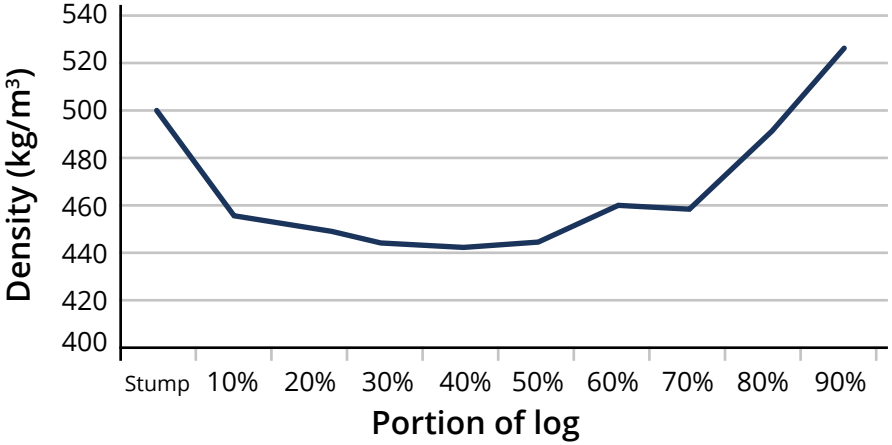
Oven-dry density throughout a typical hemlock log



Wood density is greater at the stump end.

Putting this together, green density is typically banana-shaped.

Green density of logs at Elk Bay



Because the heavier stump portion is quite short, it rarely causes flotation problems. It is the tops that are most likely to sink.

Fell trees before September 1 to avoid flotation problems in winter.

Live hemlock recharge with water in early summer and in autumn.[3,4,5] Warm temperatures in the summer are usually enough to offset spring and summer moisture recharges. But some hemlock felled after September 1 have been found to take on enough ambient moisture during autumn and winter to cause flotation problems, even if they were sufficiently dry to float when they were felled.[6] Trees felled before September and dried during summer stayed light enough to float when watered, even if watering was delayed until wet winter conditions set in.

Felled hemlock tend not to lose moisture content during winter and early spring.[7] It is only when temperatures increase that problem hemlock lose enough water to allow them to float.

This means that hemlock felled after September 1 may need to dry through July before being watered (if their moisture content is more than 53%).

Trees take on most water in the first week of being watered.

When freshly watered hemlock were observed for 16 weeks, there was a visible decrease in flotation during the first week, but after that, no further water uptake was noticeable. Additionally, when hemlock were watered, moisture content was most likely to increase in trees that had been cut for less than three months. Hemlock that had been cut for more than three months did not take on much water, even though they had a fresh processing cut on their butts a day before watering.

Bark on or off does not make a difference to hemlock flotation.

A trial on the effects of bark on or off showed there was no difference to hemlock flotation, regardless of the length of the flotation period.[8]

Wicking does not effectively reduce moisture content in felled hemlock.

The practice of leaving branches attached to hemlock stems made no difference to hemlock stem moisture content at any point in a three-month period.[9]

Bundle problem hemlock with lighter trees.

If hemlock are known or suspected to be too heavy to float, they may be bundled with lighter trees like cedar before they are watered. Keep careful track of mixed bundles to prevent inefficiency in handling at the mill.

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