1865 THE UNIVERSITY OF MAINE
Cooperative Extension
Pest Management Unit

Maine Tree Fruit Newsletter

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PFAS Risk in Maine

PFAS is the group name acronym for **P**er**f**luoro**a**lkyl **S**ubstances. PFOS, PFOA and other compounds are specific types of PFAS. PFAS contamination of soil and water and accumulation in livestock products are the current topics of highest concern. When plants are grown on PFAS contaminated soil, PFAS (and especially PFOS) appears to accumulate less in the fruit portion than in vegetative parts (leaves and stems). But that finding is based on preliminary data, and fruit growers are also not free and clear from PFAS concern for other reasons. While orchards are less likely than dairy farms and hay fields to have received sludge application, application on nearby properties could affect orchards through well contamination and water transport. Water applied to harvested crops is a potential contamination pathway.

PFAS was used in many household and industrial products. These chemicals were used to make products repel water and resist stains and grease. PFOS and PFOA were in carpet, fabric, clothing, food packaging, pots and pans, personal care products such as dental floss, and in firefighting foams. Most companies have stopped using them. Even though PFAS-containing products were used worldwide, Maine is on the cutting edge of dealing with PFAS contamination due to recent detections in farm soils, water, and farm products at levels far above acceptable thresholds. The state and university are actively studying this issue and developing guidelines, support services, resources, and policies.

1) Excerpt from: **"PFAS: What can I do to protect myself and my farm?"** Maine Farmland Trust. https://www.mainefarmlandtrust.org/wp-content/uploads/2022/01/PFAS-PDF_FINAL101421.pdf

"What are PFAS? Per- and polyfluoroalkyl substances (PFAS) are man-made chemicals that are stable and persistent in the environment, bio-accumulative, toxic at low concentrations, and easily transferred to groundwater and other media.

Why should I be concerned? PFAS accumulate in humans and animals. Studies suggest PFAS exposure can lead to increased cholesterol levels; changes in liver enzymes; decreased vaccine response in children; decreased birth weight; thyroid disease; increased risk of high blood pressure or pre-eclampsia in pregnant women; and increased risk of kidney or testicular cancer."

Testing has found PFAS levels far above action thresholds at some Maine farms where wastewater treatment plant sludge or industrial sludge had been applied.

2) Slides from 2022 Maine Ag Trades Show
"Assessing PFAS in Agricultural Settings – 'Things we have learned in the past 5 years' "
Andrew Smith, Maine Center for Disease Control and Prevention
https://www.maine.gov/dacf/ag/pfas/docs/ats-mecdc-pfas-talk-1142022.pdf

3) Excerpt from: **"Guide to Investigating PFAS Risk on Your Farm"** by Richard Kersbergen.
https://extension.umaine.edu/agriculture/guide-to-investigating-pfas-risk-on-your-farm/#1

"A quick note regarding units of concentration:

PFAS concentrations in soils and other solid materials including biosolids are typically reported by labs and in Maine DEP and Maine CDC literature in parts per billion. PFAS concentrations in liquids (including water and milk) are typically reported in parts per trillion.

Parts per billion (ppb) and parts per trillion (ppt) are extremely small units of measurement. A part per billion is equivalent to 1 second in nearly 32 years. (Ed. note, thus a part per trillion is equivalent to 1 second in about 32,000 years.) A part per trillion is the same as a single drop of water in 20 Olympic-sized swimming pools. Measuring at ppt can be difficult for many laboratories, depending on the individual lab's level of technology. However, even at very small concentrations PFAS compounds may be harmful to human health."

"**A quick note on background levels:**

If your land has no history of biosolids use, and is not located adjacent to a parcel with a history of biosolids use, firefighting foam use (often associated with Department of Defense sites) and/or PFAS manufacturing plants, it is unlikely that your soil and well water are highly contaminated. However, it is still possible that testing for PFAS could still reveal trace levels in soil, which are referred to as background levels. A study by the University of Vermont which has been widely cited indicates that presumed background levels in soils from Vermont towns and parks have a median concentration of 0.39 ppb for PFOA and 0.68 ppb for PFOS. Maine is currently working on a similar state-specific study of background concentrations in agricultural soils that the DEP anticipates will be available sometime in early 2022.

Other sources of PFAS to soil include irrigation water, aerial deposition, and potentially even rainwater. If PFAS have found their way to groundwater, irrigation water pumped from a drilled or dug well may be contaminated, and the PFAS from that contaminated water will build up in the irrigated soil over time. There are also a few documented cases of elevated levels of PFAS in soils in the vicinity of manufacturing facilities that used PFAS in their processes in southern New Hampshire, southwestern Vermont and upstate New York; these elevated levels are believed to be due to deposition of airborne PFAS compounds. Rainwater can also be a factor contributing to what would be considered "background" levels of PFAS on fields that may have never received any biosolids. At least one study has documented measurable levels of PFAS in rainwater, but further study is needed to confirm this pathway. Groundwater can also be impacted by sources other than biosolids, such as leaking residential septic systems.

Once PFAS have accumulated in soil, they tend to stay in the soil, although some also leaches to groundwater. There are two pathways for PFAS in soil to make their way into plants: through direct uptake by roots, and through physical contamination of the edible portion of the plant (above-ground or below-ground) coming into contact with the soil and adhering to the harvested plant material. Preliminary research indicates that different parts of plants take up PFAS at different rates, and that vegetative parts of plants (leafy greens, grass forages, etc.) take up more PFAS than the fruiting parts of plants (which includes grains).

Initial investigations by Maine CDC and the University of Maine Cooperative Extension indicate that corn silage is less likely to take up PFAS compounds into the plant than is grass, and that transfer to grain corn is minimal to none. Ongoing research is needed to refine and verify these findings, but for now, these apparent differences in uptake rates by different types of crops provide producers with options on how to mitigate the risks of elevated PFAS levels in their soils…"

"If irrigation water and/or wash water is contaminated, then in addition to the pathways described above for soil-to-plant transport, there is the added pathway of contaminated water coming into direct contact with the above-ground portions of the plant."

Some PFAS Screening Levels as of June 2021 (subject to change*)

Compound	Material or Site	Screening Level in parts per billion
PFOS	Soil screening level for typical Maine dairy farm: more feed from corn silage and grain than grass or hay.	13.80
PFOS	Soil screening level for grass-fed dairy: feed primarily grass and hay grown in contaminated soil on-site.	6.80
PFOS	Remedial action guideline for soil leaching to groundwater.	3.60
PFOS	Beef*	3.40
PFOS	Milk*	0.21
PFOS + PFOA + PFHpA + PFNA + PFHxS + PFDA	Interim Residential Drinking Water standard*	0.02

* The food and water screening levels shown seem likely to be lowered given that the current values are based on an Environmental Protection Agency (EPA) tolerable daily dose that is much higher than used by individual states. For example, the EPA tolerable level is more than 11 times larger than the level used in NY and NJ, and more than 30 times larger than proposed for use in CA. In addition, interagency procedural differences, such as between the US Food and Drug Administration and the EPA, could also cause screening levels to be lowered.

Maine Preseason Tree Fruit Webinars

Wednesdays at 7pm: March 2, March 16, March 30, 2022

Wed., March 2 Zoom link https://maine.zoom.us/j/86822754369

7:00pm **Legislative update.** Maine State Sen. Jim Dill and Sen. Jeff Timberlake.
7:30pm **Highmoor Farm research update.**
Dr. Renae Moran, UMaine - Predicting soft scald and bitter pit in Honeycrisp apples.
Dr. Peyton Ginakes, UMaine - Cold hardiness and fruit quality in new peach varieties.
8:15pm **Discussion, Q&A with audience**
8:30pm **Adjourn**

Wed., March 9 Zoom link https://maine.zoom.us/j/87463531466

7:00pm **Vertebrate orchard pests.** Adam Vashon, USDA APHIS Wildlife Service.
Assistance with deer, vole, turkey, squirrel, porcupine and other wildlife problems.
7:30pm **Successful Electric Fencing.** Allen LeBrun, North Chester Orchard.
7:50pm **Discussion, Q&A**
8:00pm **Adjourn**

Wed., March 16 Zoom link https://maine.zoom.us/j/88397126798

7:00pm **Status reports - Browntail moth, Winter moth, Brown marmorated stinkbug, Spotted lanternfly.**
Dr. Hillary Peterson, Maine Dept. Ag. Cons. & Forestry.
7:30pm **Maine Board of Pesticides Control Update.**
John Pietroski, Maine Dept. Ag. Cons. & Forestry.
8:00pm **Discussion, Q&A**
8:15pm **Adjourn**

Wed., March 23 Zoom link https://maine.zoom.us/j/89853154768

7:00pm **Old Rules, New Tools for Apple IPM.**
Glen Koehler, UMaine Cooperative Extension.
7:45pm **Discussion, Q&A with audience**
8:00pm **Adjourn**

The Maine webinars listed above do not qualify for pesticide applicator recertification credits, but the sessions with *** below each qualify for 1 credit with preregistration..

Remaining NE-NY Winter Tree Fruit Webinars

February 22- Precision Crop Load Management in Honeycrisp. Pre-registration at https://umass-amherst.zoom.us/meeting/register/tJ0sceGorTMrG9KDBjI_tGZeQPmjJ_RuCulO

*** **March 8** - **Bacterial Spot and Phytotoxicity of Peach.** Pre-registration at https://umass-amherst.zoom.us/meeting/register/tJwpd-6vqTIvHtxim2TihMtOgov5c0AUorLL

*** **March 15** - **Herbicides: Materials, Timing and Rates.** Pre-registration at https://umass-amherst.zoom.us/meeting/register/tJMscOyspjwqG93on4Mrz4Yj0AJ7H3ndgWGb

*** **March 22** - **Northeast Cider Apple Project.** Pre-registration at https://umass-amherst.zoom.us/meeting/register/tJIrfu2gqDojGN0ggQzv5NDTM99lMuAtgJSv

*** **March 29** - **Plum Curculio Research Update** Pre-registration at https://umass-amherst.zoom.us/meeting/register/tJMrce2vpj0rHNevn7FZpRRetls7cUUBB0Oq

Chill Requirement

The chill requirement for fruit trees to complete winter dormancy and become sensitive to accumulating growth hours as spring temperatures warm is shown below. This table has been expanded from the previous newsletter issue.

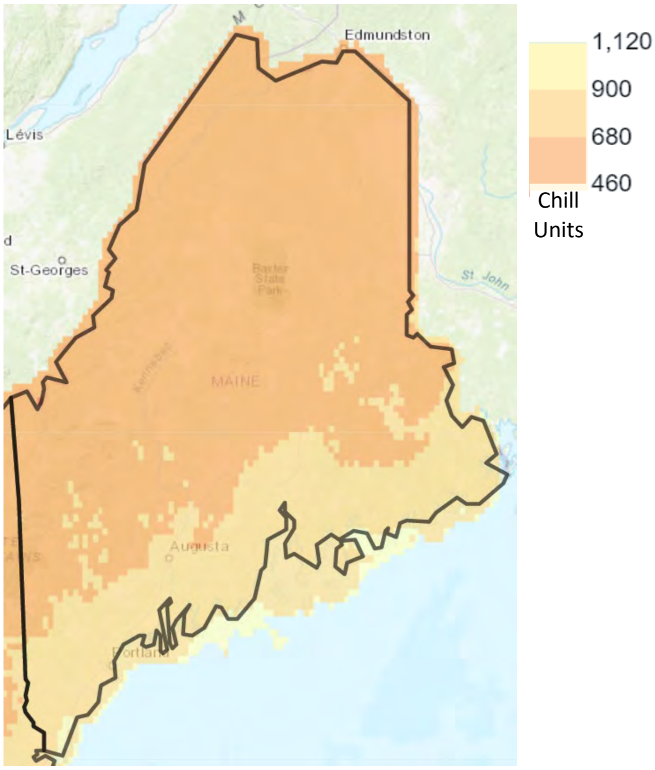
Cultivar	Chill Units from Utah or North Carolina model*	Dynamic model Chill portions
Apples		
Cripps Pink	1242	73
Delicious	1093*, 1234	---
Elstar	1027*, 1096	50, 66
Empire	**1079* (1235)**	---
Fuji	**1077*, 1307**	**77**
Gala	**1064* (1218)**	**50-55**
Galaxy Gala	1300	77
Golden Delicious	**1050* (1202)**	**50**
Granny Smith	1049*, 1239	59, 59, 73
Gravenstein	1118* (1280)	---
Honeycrisp – chill requirement said to be similar to Cripps Pink.	**1242**	**73**
Idared	**1017* (1164)**	---
Jerseymac	1120* (1282)	---
Jonamac	1133* (1267)	76
Kalei (from Gala)	1275, 1307	---
Liberty	1053* (1206)	---
McIntosh	**1086* (1243)**	---
Milton	1160* (1328)	---
Northern Spy	**1228* (1406)**	---
Prima	1072* (1227)	---
Priscilla	1057* (1210)	---
Red Delicious (Hi Early)	---	77
Spartan	1117* (1279)	---
Vista Bella	**968* (1108)**	---
Wealthy	1169* (1339)	---
Wolf River	1217* (1393)	---
Pome Fruit in general	---	High >70, Medium 30-70, Low <30

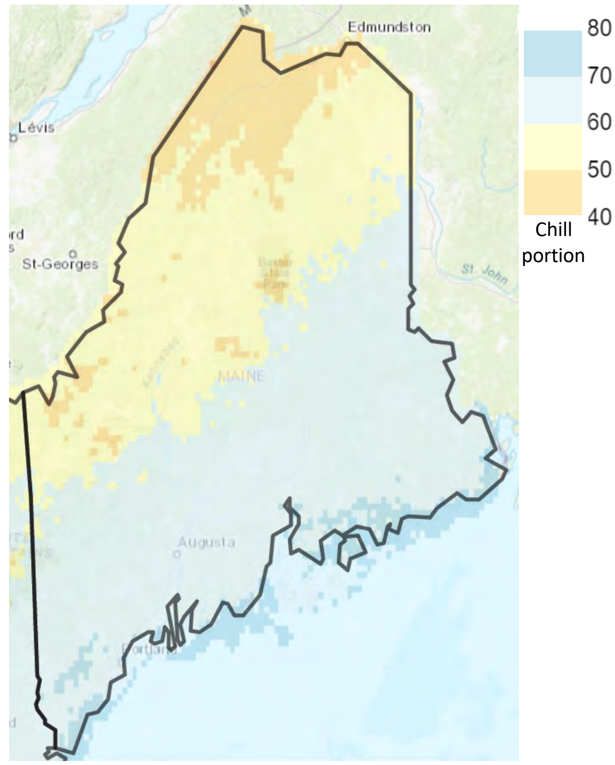
Cultivar	Chill Units from Utah model	Dynamic model Chill portions
Bartlett Pear	1210	56
Peaches		
Elberta	800	43
O'Henry	---	63
Red Haven	870	75
Stone fruit in general	---	High >30, Medium 12-30, Low <12
Sweet cherry		
Bing	880	49, 54
Brooks	---	37
Lapins	---	35
Rainier	---	45
Sam	---	70
Montmorency sour cherry	954	---
'Italian' prune	788	---
Tilton apricot	720	---

Sources: Delgadoa et al. 2021; El Yaacoubi et al. 2016; Fernandez et al. 2020; Glozer & Grant 2006; Glozer & Ingels 2007; Hauagge & Cummins 1991; Noorazar et al. 2021; Parkes et al. 2020; Pope 2015; Richardson et al. 1986; Sapkota et al. 2021; Shaltout & Unrath, 1983.

* = Values from the North Carolina (NC) model. While the NC model scores chill units differently, the cumulative values from the two models are similar. Values shown in ( ) are Utah chill unit equivalents based on NC model values scaled up 14.5%.

Cumulative Utah Chill Units and Dynamic Model Chill Portions as of February 10, 2022.
From Climatetools.org. https://climatetoolbox.org/tool/climate-mapper





Closing Words

"Without love, where would you be now?"

~ Doobie Brothers

"After all these years I have begun to wonder if the secret of living well is not in having all the answers but in pursuing unanswerable questions in good company."

~ Rachel Naomi Remen

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