STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY
BOARD OF PESTICIDES CONTROL
28 STATE HOUSE STATION
AUGUSTA, MAINE 04333

JANET T. MILLS
GOVERNOR

AMANDA E. BEAL
COMMISSIONER

BOARD OF PESTICIDES CONTROL

October 21, 2022

9:00 a.m. Board Meeting--Hybrid
Join the meeting in person in Room 101, Deering Building, 90 Blossom Lane, Augusta
Or
Join the meeting remotely by video conference hosted in MS Teams:
Join on your computer, mobile app or room device
Click here to join the meeting
Meeting ID: 293 648 268 778
Passcode: DkShJT
Or call in (audio only)
+1 207-209-4724 United States, Portland
Phone Conference ID: 647 153 89#

AGENDA

1. Introductions of Board and Staff

2. Minutes of the August 5, 2022 Board Meeting

   Presentation By: Megan Patterson, Director

   Action Needed: Amend and/or approve

3. LD 2019—An Act To Require the Registration of Adjuvants in the State and To Regulate the Distribution of Pesticides with Perfluoroalkyl and Polyfluoroalkyl Substances

   At its June 17, 2022 meeting, the Board reviewed/discussed LD 2019. It requested that the staff provide information on existing regulations relative to pesticide containers and to research options relative to defining what "contamination" means in the context of the bill. Staff has provided two memos, one summarizing the August 5, 2022 Board discussion of possible rulemaking pathways and federal preemption and a second summarizing relevant technical information prepared in response to Board member questions. The second memo also addresses the recently published EPA container leachate study.

   Presentations By: Megan Patterson, Director

   Pam Bryer, Pesticides Toxicologist

MEGAN PATTERSON, DIRECTOR
90 BLOSSOM LANE, DEERING BUILDING

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Action Needed: Review/Discuss Provided Information, Determine Next Steps

4. Invasive Invertebrate List Discussion

At its August 5, 2022 meeting, the Board finally adopted a policy on invasive invertebrate pests on ornamental vegetation in outdoor residential landscapes that may be managed with neonicotinoids. Also at that time, Board members discussed amending the list and developing a revision schedule. Members proposed continuing the relevant conversation at a subsequent meeting.

Presentations By: Karla Boyd

Action Needed: Review/Discuss Provided Information, Determine Next Steps

5. Other Old and New Business

a. EPA Memo--EPA Analytical Chemistry Branch Laboratory Study of PFAS Leaching from Fluorinated HDPE Containers

b. Variance Permit Issued to Green Thumb Lawn Services—poison ivy in Eddington

c. Variance Permit Issued to Green Thumb Lawn Services—poison ivy in Glenburn

d. Variance Permit Issued to Green Thumb Lawn Services—poison ivy in Newagen

e. Remote meeting policy

f. Adopted--Policy on Emergency Permitting for Neonicotinoids Exemption

g. Adopted--Policy on Approved Invasive Invertebrate Pests on Ornamental Vegetation in Outdoor Residential Landscape

h. EPA Memo--EPA Proposes to Stop Authorized Use of Certain PFAS In Pesticide Products

i. Published Article—Targeted analysis and Total Oxidizable Precursor assay of several insecticides for PFAS

j. Maine Department of Environmental Protection Webpage: PFAS in Products

k. Other items?

6. Schedule of Future Meetings

December 2, 2022 and January 11, 2023 are the next tentative Board meeting dates. The Board will decide whether to change and/or add dates.

The Board will also decide if there is a continuing need to meet remotely.

Adjustments and/or Additional Dates?

7. Adjourn

NOTES

- The Board Meeting Agenda and most supporting documents are posted one week before the meeting on the Board website at www.thinkfirstspraylast.org.
- Any person wishing to receive notices and agendas for meetings of the Board, Medical Advisory Committee, or Environmental Risk Advisory Committee must submit a request in writing to the Board's office. Any person with technical expertise who would like to volunteer for service on either committee is invited to submit their resume for future consideration.
- On November 16, 2007, the Board adopted the following policy for submission and distribution of comments and information when conducting routine business (product registration, variances, enforcement actions, etc.):
    - *For regular, non-rulemaking business*, the Board will accept pesticide-related letters, reports, and articles. Reports and articles must be from peer-reviewed journals. E-mail, hard copy, or fax should be sent to the Board's office or pesticides@maine.gov. In order for the Board to receive this information in time for distribution and consideration at its next meeting, all communications must be received by 8:00 AM, three days prior to the Board meeting date (e.g., if the meeting is on a Friday, the deadline would be Tuesday at 8:00 AM). Any information received after the deadline will be held over for the next meeting.
- During rulemaking, when proposing new or amending old regulations, the Board is subject to the requirements of the APA (Administrative Procedures Act), and comments must be taken according to the rules established by the Legislature.

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COMMISSIONER

BOARD OF PESTICIDES CONTROL

August 5, 2022

9:00 a.m. Board Meeting

MINUTES

1. Introductions of Board and Staff

   - Adams, Bohlen, Carlton, Ianni, Jemison, Lajoie

2. Minutes of the June 17, 2022 Board Meeting

   Presentation By: Henry Jennings

   Action Needed: Amend and/or approve

   - **Jemison/Lajoie: Moved and seconded to approve the minutes**
   - **In Favor: Unanimous**

3. Continuing Discussion on Annual Funding to Maine CDC for Mosquito Monitoring

   At its June 17, 2022 meeting, the Board entertained a report from the Maine CDC relative to its use of mosquito monitoring funds for 2021 and its plans for the use of funds in 2022. Board members had questions about the status of the insectary and efforts to monitor for insect resistance to insecticides. The Maine CDC agreed to research the Board's questions and report back at the next meeting.

   Presentation By: Sara Robinson, Infectious Disease Epidemiology Program Director

   Action Needed: Report Back Relative to Board questions; Determine Grant Funding for 2022

   - Robinson explained that mosquito monitoring acted as an early warning for viruses coming into the state and mosquito resistance monitoring allowed the state to make informed decisions about control products. She stated that the insectary was closed in 2020 due to the pandemic. Robinson told the Board that Maine CDC was currently using

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the Northeast Regional Center for Excellence in Vector-Borne Diseases, NEVBD, for resistance testing, which was funded through December 2022 by the federal CDC. In 2023 the testing would be moved from Cornell to Massachusetts and the focus would shift to ticks rather than mosquitoes. Robinson stated that for 2023 they would need to secure funding for any resistance management testing to be conducted. The current estimate she received from Cornell's lab was $15-20,000 per season, which included Cornell rearing and testing mosquito resistance against approximately 14 active ingredients.

- Adams stated that last meeting there were questions about the insectary in Maine and what the cost would be to reopen it. He asked if this was still a consideration.
- Robinson responded that right now the amount of work needed to reopen and maintain the insectary did not seem to be worth it when there was already a regional option.
- The Board inquired if there was a budget line item for the traditional funding for monitoring.
- Jennings responded that he had conversations with Patterson, and they felt that $25,000 was the amount the department could fund at this time.
- Robinson stated that the funds could flow into the monitoring program and samples could be sent to NEVBD for resistance testing for free this year.
- Jemison stated that it sounded like funds would be sufficient for this year but not for next year. He added that when considering raising fees for pesticide registration BPC staff should factor in this funding.
- There was discussion about the protocol for distributing documents that were received after the deadline.
- Randlett stated that the Board always had discretion about accepting documents after the deadline and something like this may be important to decision making.
- Robinson thanked the Board for their continuing support.
    - **Adams/Bohlen: Moved and seconded to fund the CDC mosquito monitoring program in the amount of $25,000**
    - **In Favor: Unanimous**

4. <u>LD 2019—An Act To Require the Registration of Adjuvants in the State and To Regulate the Distribution of Pesticides with Perfluoroalkyl and Polyfluoroalkyl Substances</u>

At its June 17, 2022 meeting, the Board discussed LD 2019. The Board requested that the staff provide information on existing regulations relative to pesticide containers and to research options relative to defining what "contamination" means in the context of the bill.

Presentations By: Andrew Smith, State Toxicologist, Department of Health and Human Services

Action Needed: Review/Discuss Provided Information, Determine Next Steps

- Jennings told the Board that State Toxicologist, Andrew Smith developed a conflict and would not be able to present as expected.
- Ianni asked if they should be keeping the deadline stated in LD 2019 in mind when scheduling this deeper dive workshop.
- Randlett responded in the affirmative and said it was unlikely the Board would meet the deadline, but the important point was to keep the legislature informed that they were

making a good faith effort to complete it. He added that it was highly likely any container regulations passed by the Board would be pre-empted by federal law since EPA had the sole right to regulate containers and labeling. Randlett told the Board that one option would be to adopt the federal regulation by reference, which would satisfy the legislative directive and bring the federal rule into state law.

- Adams commented that the way the bill was written it was not very specific but that there was a general sense of the underlying intent. He asked if the Board would be sidestepping the legislative intent if they adopted the federal regulations into state law.
- Randlett said that in a sense that might be true, but the Board only had so much authority and any rules they made might not be legal and that this should have been caught at the LD level. He stated that the Board also had the options of going back to the legislature and letting them know they were running into legal issues with federal preemption or to delay and do the research and try to find a tiny slice that might be available for state regulation.
- Ianni stated that she looked through handouts of federal regulation and asked if there was anything that covered container specifications in regard to PFAS for adjuvants. She asked who the Board would inform at the legislature, so they understood that the Board had been working on this topic.
- Randlett spoke about federal standards and regulations for PFAS. He said that the only other thing the Board could do would be to require registrants to state whether products are stored in containers that contain PFAS. He added that they could possibly create laws about the handling of containers. Randlett stated that it was usually someone from the department who would inform the legislature of what the Board was working on.
- Gibbs explained that sometimes the legislature mandated the Department to do something without knowing all that may be involved and the deadline they set can occasionally be unrealistic. She added that staff normally would relay information to Emily Horton who was constantly in touch with legislators, and they could also put together an interim report or some written documentation if needed.
- Bohlen commented that he supported moving forward with the education piece because this topic was going to keep coming back.
- Jemison stated that he supported that and asked if there was any word on the EPA leachate study which was a key piece of information the Board needed to review to move forward.
- Gibbs told the Board that staff was also trying to get someone from DEP to talk about containers.
- Jemison stated that there was a program leadership team in extension that has been focused on PFAS and that they would benefit from attending this as would several people in the public. He said he thought it would be beneficial and informative to many people, including DEP, DACF, and extension staff if the Board opened up part of the meeting to comments and questions from attendees.
- Adams agreed and said the more people involved, the better.
- The Board decided to cancel the September meeting due to scheduling conflicts.
- The Board asked to have the October Board meeting in the morning and a work session in the afternoon.

    - **Carlton/Jemison: Moved and seconded to table this agenda item until the next meeting**
    - **In Favor: Unanimous**

5. Adoption of Proposed Rule Amendments to Chapter 41

On June 17, 2022, the Board held a public hearing to solicit comments relative to proposed amendments to Chapter 41 of its rules. No comments were received on the proposal. The Board will consider whether to adopt the proposed amendments, together with the basis statement, response to comments, and the statement of impact on small business.

Presentation By: Karla Boyd

Action Needed: Determine Whether to Adopt Amendments to Chapter 41

- Boyd stated that at the last meeting the Board held a public hearing, and no comments were received. The Board could now determine if they would like to adopt the rule.
- Jennings explained that the small change to the wording highlighted in Section 6B was for clarification purposes.
- Ianni asked about the definition of residential use and if a rental property would be considered residential.
- Jennings responded that it could not be added to the rule at this juncture, but the Board could develop a policy about what residential entails and then incorporate it during the next round of rulemaking.
- Jemison noted that he still had a desire to revisit this rule soon to make changes to address the plant-incorporated protectant section that needed updating.
- Ianni noted a small typo in item two of the 'Identification of the Types and an Estimate of the Number of the Small Businesses Subject to the Proposed Rule' section that needed to be corrected.
    - **Jemison/Ianni: Moved and seconded to adopt the proposed rule, basis statement, response and summary of comments and the statement of impact on small business**
    - **In Favor: Unanimous**

6. Consideration of a Consent Agreement with Nervous Ticks, Edgecomb, Maine

On June 3, 1998, the Board amended its Enforcement Protocol to authorize staff to work with the Attorney General and negotiate consent agreements in advance on matters not involving substantial threats to the environment or public health. This procedure was designed for cases where there is no dispute of material facts or law, and the violator admits to the violation and acknowledges a willingness to pay a fine to resolve the matter. This case involved an unlicensed company making commercial applications of a FIFRA Section 25B exempt pesticide to residential properties.

Presentation By: Ray Connors, Manager of Compliance

Action Needed: Review and/or Approve

- Connors stated that staff was made aware of this violation via an article in a newspaper. He said that the first inspection confirmed that the company was making unlicensed pesticide applications for hire. They had made approximately 49 applications.
- Jemison asked if the individuals knew about the requirement for licensure.
- Connors stated that one of them had taken applicator exams but had not passed. The applicator stated that they did not think they needed to be licensed to apply 25b exempt products.
- Ianni noted that it would be useful if the consent agreements stated the pesticide that had been used. She asked if the company still maintained a website claiming their product was all natural and if staff go back and check with cases like this to make sure they are posting appropriately.
- Connors stated that there was a follow-up inspection after this, including putting a Stop-Sale-Use-Removal Order (SSURO) on the product they were using because they were not licensed to use it. He added that staff could also review the website.
- Tomlinson commented that the company does still have false and misleading claims on its website but since they are not the company that produces the pesticide it limited BPC authority. She added that a report could be made to the Federal Trade Commission.
    - **Jemison/Carlton: Moved and seconded to approve the consent agreement**
    - **In Favor: Unanimous**

7. Board Discussion/Review of Penalties and Assessment Rationale

At its June 17, 2022 meeting, Board members voiced questions relative to how fines are calculated and whether some fines should be higher. The Board requested that the matter be placed on a future agenda for discussion and review.

Presentation By: Raymond Connors/Henry Jennings

Action Needed: Provide Guidance to the Staff

- Jennings stated this question had come back frequently over the years and it is not an easy one to solve.
- Randlett stated that the Board had looked at this before and it was extremely difficult to create a penalty schedule for these types of violations. He gave an example to show the natural inequity that can be created using a penalty schedule to take in the seriousness of the offense. Randlett stated that the goal was to create a significant enough penalty to create a deterrent in the regulated community.
- Randlett noted that the penalty structure had not been changed in many years. He said that if the Board had issues with the current amounts in statute they would need to be raised by the legislature.
- Connors stated that they needed to consider toxicity of the product, what its impact was and what could have been the impact.
- Adams thanked Randlett for the explanation and asked if what they were charging was really a deterrent.
- Ianni asked how old the provision was establishing the current penalty amounts.

- Jennings stated that he was almost positive that the $1,500 amount went back to 1989.
- Ianni suggested that at some point maybe the Board could do a session on impact to health and the environment. She would like to know how staff does that assessment.
- Adams responded that if the current fee structure went back to 1989 then that alone was justification for approaching the ACF committee and asking them to look at it. He stated that staff should consider sending a letter to the ACF committee asking them to take a look at the penalty schedule.

8. Consideration/Adoption of Board Policies Relative to Invasive Invertebrate Pests and Emergency Uses of Neonicotinoids

Recent amendments to the Board's statutes required the Board to conduct rulemaking to place limitations on the use of certain neonicotinoid active ingredients on residential landscapes. Once the Board finally adopts those rule amendments, it will need to adopt two policies relative to the operation of the rule, including: 1) a list of invasive invertebrate pests; and 2) a policy on the issuance of emergency use permits. The staff has developed two policies and a draft permit application form for the Board's consideration.

Presentation By: Karla Boyd

Action Needed: Amend and/or approve

- Boyd explained the proposed policies related to Chapter 41 and told the Board they could add to the list of invasive vertebrate pests if they desired.
- Bohlen stated that the list of three was very short and he could think of others that could be added. He told staff that he would like to take a look at this and add some additional species and that the list should be reviewed at least annually. Bohlen suggested staff create a schedule for revisiting the list.
    - **Bohlen/Jemison: Moved and seconded to approve adoption of Board policies relative to invasive invertebrate pests and emergency uses of neonicotinoids**
    - **In Favor: Unanimous**

9. Other Old and New Business

a. Variance Permit Issued to Basswood Environmental, LLC.

b. Variance Permit Issued to Midcoast Conservancy

c. Variance Permit Issued to Dubois Contracting

d. Other items?

10. Schedule of Future Meetings

October 21, 2022 and December 2, 2022 are the next tentative Board meeting dates. The Board will decide whether to change and/or add dates.

- Jennings stated that Andy Smith replied that he could attend the October 21 meeting.

- Adams stated that he would like to hear from UMaine extension folks, DEP and Andy Smith.
- Ianni noted that the discussion should be focused on PFAS that are potentially in pesticides through chemical reactions that are occurring between the pesticides and the containers that they are in.
- Bohlen stated that there were a number of pesticides that were themselves PFAS under certain definitions so he would like to hear more about that topic. He added that he would like to get a little bit of the larger context to understand how it all fits together and to get an idea of what percent of the PFAS problem pesticides and containers were.
- Carlton noted that they would need a well-defined scripted agenda to ensure the meeting did not go off-topic.

11. Adjourn

    - **Jemison/Carlton: Moved and seconded to adjourn at 11:28 AM**
    - **In Favor: Unanimous**

LAW WITHOUT GOVERNOR'S SIGNATURE

APRIL 28, 2022

CHAPTER 673

PUBLIC LAW

STATE OF MAINE

IN THE YEAR OF OUR LORD

TWO THOUSAND TWENTY-TWO

H.P. 1501 - L.D. 2019

An Act To Require the Registration of Adjuvants in the State and To Regulate the Distribution of Pesticides with Perfluoroalkyl and Polyfluoroalkyl Substances

Be it enacted by the People of the State of Maine as follows:

Sec. 1. 7 MRSA §604, sub-§22-A is enacted to read:

22-A. Perfluoroalkyl and polyfluoroalkyl substances or PFAS. "Perfluoroalkyl and polyfluoroalkyl substances" or "PFAS" has the same meaning as in Title 32, section 1732, subsection 5-A.

Sec. 2. 7 MRSA §604, sub-§25, as amended by PL 2005, c. 620, §3, is repealed and the following enacted in its place:

25. Pesticide. "Pesticide" means:

A. Any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pests;

B. Any substance or mixture of substances intended for use as a plant regulator, defoliant or desiccant; and

C. Any substance or mixture of substances intended to be used as a spray adjuvant.

"Pesticide" includes a highly toxic pesticide.

Sec. 3. 7 MRSA §604, sub-§31-A is enacted to read:

31-A. Spray adjuvant. "Spray adjuvant" means any wetting agent, spreading agent, sticker, deposit builder, adhesive, emulsifying agent, deflocculating agent, water modifier or similar agent that is intended to be used with any other pesticide as an aid to the application or the effect of it and that is in a package or container separate from that of the other pesticide.

Sec. 4. 7 MRSA §606, sub-§1, as amended by PL 2021, c. 105, §§1 to 3, is further amended to read:

1. Unlawful distribution. A person may not distribute in the State any of the following:

A. A pesticide that has not been registered pursuant to the provisions of this subchapter;

B. A pesticide if any of the claims made for it or any of the directions for its use or other labeling differs from the representations made in connection with its registration, or if the composition of a pesticide differs from its composition as represented in connection with its registration; a change in the labeling or formulation of a pesticide may be made within a registration period without requiring reregistration of the product if the registration is amended to reflect that change and if that change will not violate any provision of FIFRA or this subchapter;

C. A pesticide unless it is in the registrant's or the manufacturer's unbroken immediate container and there is affixed to the container, and to the outside container or wrapper of the retail package, if there is one, through which the required information on the immediate container cannot be clearly read, a label bearing the information required in this subchapter and rules adopted under this subchapter;

D. A pesticide that has not been colored or discolored pursuant to section 610, subsection 1, paragraph D;

E. A pesticide that is adulterated or misbranded or any device that is misbranded;

F. A pesticide in containers that are unsafe due to damage; ~~or~~

G. Beginning January 1, 2022, a pesticide containing chlorpyrifos as an active ingredient~~.~~;

H. A pesticide that has been contaminated by perfluoroalkyl and polyfluoroalkyl substances; or

I. Beginning January 1, 2030, a pesticide that contains intentionally added PFAS that may not be sold or distributed pursuant to Title 38, section 1614, subsection 5, paragraph D.

Sec. 5. 7 MRSA §606, sub-§2, as amended by PL 2005, c. 620, §5, is further amended to read:

2. Unlawful alteration, misuse, divulging of formulas, transportation, disposal and noncompliance. A person may not:

A. Detach, alter, deface or destroy, wholly or in part, any label or labeling provided for in this subchapter or rules adopted under this subchapter;

A-1. Add any substance to or take any substance from a pesticide in a manner that may defeat the purpose of this subchapter or rules adopted under this subchapter;

B. Use or cause to be used any pesticide in a manner inconsistent with its labeling or with rules of the board, if those rules further restrict the uses provided on the labeling;

C. Use for that person's own advantage or reveal, other than to the board or proper officials or employees of the state or federal executive agencies, to the courts of this State or of the United States in response to a subpoena, to physicians, or in emergencies to pharmacists and other qualified persons for use in the preparation of antidotes, any information relative to formulas of products acquired by authority of section 607 or any information judged by the board to contain or relate to trade secrets or commercial

or financial information obtained by authority of this subchapter and marked as privileged or confidential by the registrant;

D. Handle, transport, store, display or distribute pesticides in such a manner as to endanger human beings or their environment or to endanger food, feed or any other products that may be transported, stored, displayed or distributed with such pesticides;

E. Dispose of, discard or store any pesticides or pesticide containers in such a manner as may cause injury to humans, vegetation, crops, livestock, wildlife or beneficial insects or pollute any water supply or waterway;

F. Refuse or otherwise fail to comply with the provisions of this subchapter, the rules adopted under this subchapter~~,~~ or any lawful order of the board; ~~or~~

G. Apply pesticides in a manner inconsistent with rules for pesticide application adopted by the board~~.~~; or

H. Use or cause to be used any pesticide container inconsistent with rules for pesticide containers adopted by the board.

Sec. 6. Board of Pesticides Control; rules. The Department of Agriculture, Conservation and Forestry, Board of Pesticides Control shall adopt rules regulating pesticide containers as authorized in the Maine Revised Statutes, Title 7, section 606, subsection 2, paragraph H no later than January 1, 2023. Rules adopted pursuant to this section are routine technical rules as defined in Title 5, chapter 375, subchapter 2-A.

Sec. 7. Appropriations and allocations. The following appropriations and allocations are made.

AGRICULTURE, CONSERVATION AND FORESTRY, DEPARTMENT OF

Office of the Commissioner 0401

Initiative: Provides allocations for position technology and STA-CAP costs.

OTHER SPECIAL REVENUE FUNDS	**2021-22**	**2022-23**
All Other	$0	$11,502
OTHER SPECIAL REVENUE FUNDS TOTAL	$0	$11,502

Pesticides Control - Board of 0287

Initiative: Provides allocations for one Environmental Specialist III position, one part-time Environmental Specialist II position, one part-time Office Associate II position and associated All Other costs.

OTHER SPECIAL REVENUE FUNDS	**2021-22**	**2022-23**
POSITIONS - LEGISLATIVE COUNT	0.000	1.000
POSITIONS - FTE COUNT	0.000	1.000
Personal Services	$0	$168,311
All Other	$0	$10,500
OTHER SPECIAL REVENUE FUNDS TOTAL	$0	$178,811

AGRICULTURE, CONSERVATION AND FORESTRY, DEPARTMENT OF DEPARTMENT TOTALS	2021-22	2022-23
OTHER SPECIAL REVENUE FUNDS	$0	$190,313
DEPARTMENT TOTAL - ALL FUNDS	$0	$190,313

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AMANDA E. BEAL
COMMISSIONER

Memorandum

To: Board of Pesticides Control

From: Megan Patterson | Director | Maine Board of Pesticides Control

Subject: Summary of the August 5, 2022 Board Discussion of Pesticide Container Regulation

Date: October 21, 2022

Introduction

At its June 17, 2022 meeting, the Board discussed LD 2019—An Act to Require the Registration of Adjuvants in the State and to Regulate the Distribution of Pesticides with Perfluoroalkyl and Polyfluoroalkyl Substances. The Board requested information on existing regulations relative to pesticide containers and asked staff to research options relative to defining what "contamination" means in the context of the bill. For the August 5, 2022 meeting, staff compiled federal pesticide container regulations and presented this information to the Board. To aid in facilitating continued discussion of pesticide container regulation staff have prepared a summary of and responses to comments and questions from the August 5, 2022 meeting. For additional context, all comments and questions referenced may also be found in the August 5, 2022 minutes.

Several Board members expressed concern about meeting the statutory deadline for container-related rulemaking.

As mentioned at the August 5, 2022 meeting, it is unlikely that the Board will meet the statutory deadline, but it is important to keep the legislature informed that the Board is making a good faith effort to complete the directive. If the Board agrees, staff will prepare a progress report for the legislature in the form of a letter. Staff will work with the DACF Commissioner's Office to submit the letter to the legislature.

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Federal preemption of pesticide container regulation was discussed.
Staff thought it might be helpful for the purposes of discussion to reference the federal laws establishing federal preemption over pesticide containers. Preemption occurs when a higher level of government reduces or limits the authority of a lower level of government over an issue. For instance, if federal and state law conflict, then the federal law has authority.

EPA establishes preemptive authority over the regulation of containers here:

> *7 U.S.C. § 136v(b)—Authority of States:*
> *A State may regulate the sale or use of any federally registered pesticide or device in the State, but only if and to the extent the regulation does not permit any sale or use prohibited by this subchapter.*
>
> *(b)UNIFORMITY*
> *Such State shall not impose or continue in effect any requirements for labeling or packaging in addition to or different from those required under this subchapter.*

EPA further explains that package/packaging is defined as follows:

> *40 CFR part 152.3 Definitions:*
> *Package or packaging means the immediate container or wrapping, including any attached closure(s), in which the pesticide is contained for distribution, sale, consumption, use, or storage. The term does not include any shipping or bulk container used for transporting or delivering the pesticide unless it is the only such package.*

The Board discussion included several possible responses to the legislative rulemaking directive. Options discussed included:

1. Adopting the relevant federal regulations by reference.
2. Let the legislature know that the Board has encountered legal issues with federal preemption.
3. Do the research and attempt to find some small regulatory gap that might present an opportunity for state regulation.
4. Require registrants to state whether products are stored in containers that contain PFAS.*

*On May 16, 2022, the Board completed rulemaking to require pesticide product registrants to complete a series of affidavits as a part of the pesticide product registration process. The affidavits require registrants to address the use of container fluorination for packaging and presence of PFAS in product formulations.

The Board asked about regulations addressing PFAS and adjuvants.
In 2022, the 130th legislature passed LD 2019(PL 2022 c. 673) which, in part, added adjuvants to the umbrella definition of pesticide (7 M.R.S.A. §604). While it is a policy decision, staff have presumed that all regulations pertaining to pesticides now extend to adjuvants.

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COMMISSIONER

Memorandum

To: Board of Pesticides Control

From: Pamela J. Bryer, Ph.D. | Pesticides Toxicologist | Maine Board of Pesticides Control

Subject: PFAS Container Contamination Updates

Date: October 21, 2022

Introduction

The board is currently tasked with regulating pesticide containers. This memo serves to answer some of the questions posed by board members at the August 5, 2022 board meeting and the topics range widely. Included in this memo is coverage of EPA's container study which has recently been reported to the public; a discussion of the use of some PFAS to directly coat food containers; a statistic indicating the percentage of the US pesticide container supply that is likely treated with fluorination; the current understanding of how much PFAS is in the US food supply; a review of how many pesticides are considered to be PFAS themselves under Maine's definition; a review of a recent EPA press release on the removal of several ingredients from the list of inerts allowed in pesticides because they are PFAS; and finally, there is mention of a recent paper detailing PFAS contamination of several insecticide products.

EPA Container Study Findings -*how likely is PFAS contamination a product of fluorination?*

Previously, the board has been supplied the results of EPA testing demonstrating *de novo* generation of PFAS in pesticide products due entirely to containerization in fluorinated HDPE plastic containers. The staff at EPA's Fort Meade Laboratory conducted a follow-up study to determine if PFAS would 1) leach into water as well as oily substances and 2) how storage duration affected leaching. In late summer 2022, those data were reported,[1]

The full report released by EPA is included in the board packet. In summary, the basic findings of the report were:

1) oil-based and water-based fluids are both likely to contain PFAS following storage in fluorinated HDPE containers,
2) water-based fluids are likely to contain a significantly lower concentration of PFAS than oily-based fluids (oil-based concentration ≤ 15 ppb while the water-based concentration ≤ 3 ppb)
3) longer storage times generate greater accumulations of PFAS, up to 20 weeks, a pattern seen in both water- and oil-based fluids.

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4) samples from plastic containers that were not fluorinated (the control containers) contained ≤ 0.04 ppb PFAS,
5) the PFAS identified were:

PFBA	PFOA
PFPeA	PFNA
PFHxA	PFDA
PFHpA	PFUdA

EPA explained that manufacturers with information that their products contain quantifiable levels of any PFAS compounds are required under FIFRA 6(a)(2) reporting requirements to submit information to EPA about the contamination of the pesticide products within 30 days. EPA has declared that PFAS found in pesticide products are a "toxicological concern". The quantifiable presence of PFAS triggers 6(a)(2) reporting.

Section 6(a)(2) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) states: "If at any time after the registration of a pesticide the registrant has additional factual information regarding unreasonable adverse effects on the environment of the pesticide, he shall submit such information to the Administrator."

Section 152.50(f)(3) of 40 CFR § 159.152 requires applicants to submit, as part of an application for registration, any factual information of which he is aware regarding unreasonable adverse effects of the pesticide on humans or the environment, which would be required to be reported under section 6(a)(2) if the product were registered.

Information about containers *-how widespread is the scope of fluorinated containers?*

It is currently understood that approximately 20 to 30% of the plastic containers used for pesticide, fertilizers, adjuvants are fluorinated.[2] Beyond this statistic there is little understanding of patterns of fluorinated container use.

PFAS-contamination in context of food packaging *-how often does PFAS leaching occur?*

Note: the information on food packaging and FDA is included for two reasons, 1) these data are a window into the potential for the likelihood of movement from a package into its contents and 2) these data represent the larger context of PFAS exposure across our lifetime. This information does not directly bear on container fluorination leaching but it reflects on container-generated PFAS contamination and how federal agencies currently address the topic. As detailed below, some food containers are currently coated with PFAS barriers under FDA authority.

The FDA has been studying PFAS in food since the 1990s. Analytical technology has changed and we are currently able to detect PFAS at much lower concentrations than the initial studies. FDA currently allows the use of many PFAS compounds for food-contact surfaces and food manufacturing equipment. Over the past 20 years, voluntary phase-outs have occurred such that currently PFOA, PFOS, and 6:2 FTOH are no longer used in the US for food-contact uses. FDA is aware of the movement of PFAS into food.

US FDA webpage snippet (available at https://www.fda.gov/food/chemical-contaminants-food/authorized-uses-pfas-food-contact-applications) discussing currently authorized uses of PFAS:

<< Per and Polyfluoroalkyl Substances (PFAS)

Since the 1960s, the FDA has authorized specific PFAS for use in specific food contact applications. Some PFAS are used in cookware, food packaging, and in food processing for their non-stick and grease, oil, and water-resistant properties. To ensure food contact substances are safe for their intended use, the FDA conducts a rigorous scientific review before they are authorized for the market.

PFAS that are authorized for use in contact with food generally fall into four application categories:

- Non-stick cookware: PFAS may be used as a coating to make cookware non-stick.
- Gaskets, O-Rings, and other parts used in food processing equipment: PFAS may be used as a resin in forming certain parts used in food processing equipment that require chemical and physical durability.
- Processing aids: PFAS may be used as processing aids for manufacturing other food contact polymers to reduce build-up on manufacturing equipment.
- Paper/paperboard food packaging: PFAS may be used as grease-proofing agents in fast-food wrappers, microwave popcorn bags, take-out paperboard containers, and pet food bags to prevent oil and grease from foods from leaking through the packaging.

<Take away>
FDA allows companies to use PFAS on food contact surfaces. It regulates specific PFAS for specific uses.

US FDA webpage snippet (available at: https://www.fda.gov/food/chemical-contaminants-food/authorized-uses-pfas-food-contact-applications) discussing PFAS in food:

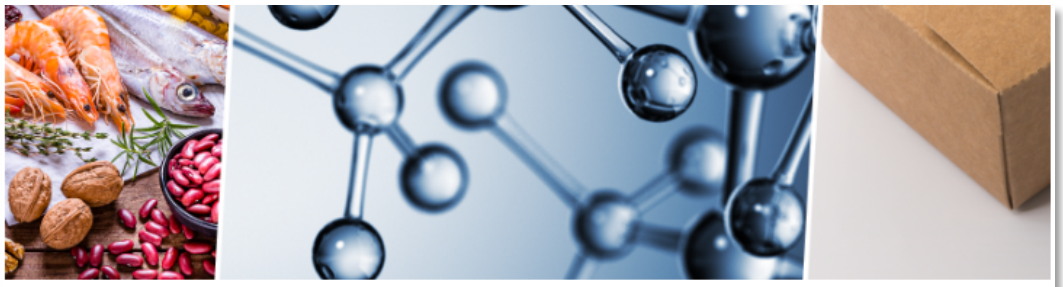
Assessing PFAS Migration Potential from Food Contact Applications

The extent to which PFAS authorized for use in food contact applications migrate to food depends on the molecular structure of the substance, how the final consumer product is manufactured, and its intended use.

- Non-stick cookware: PFAS molecules are polymerized (i.e., joined together to form large molecules) and then applied to the surface of the cookware at very high temperatures, which tightly binds the polymer coating to the cookware. This process vaporizes off virtually all the smaller (i.e., migratable) PFAS molecules. The result is a highly polymerized coating bound to the surface of the cookware. Studies show that this coating contains a negligible amount of PFAS capable of migrating to food.
- Gaskets, O-Rings, and other parts used in food processing equipment: PFAS molecules are polymerized and the resultant large molecules are further joined together (i.e. "crosslinked") to create a resin that is formed into parts such as sealing gaskets and O-rings, typically used in food processing equipment. This process removes virtually all the smaller (i.e., migratable) PFAS molecules, resulting in a negligible amount of PFAS capable of migrating to food.
- Processing aids: PFAS molecules may or may not be polymerized. However, the amount of PFAS used as processing aids in the manufacture of other food contact polymers is so small that a negligible amount of PFAS is capable of migrating to food from this use.
- Paper and paperboard food packaging: PFAS molecules are not polymerized, but rather are attached to other non-PFAS polymerized molecules as smaller "sidechains" to form the final grease-proofing agent that is applied to the paper packaging. Grease-proofing agents are applied to paper/paperboard packaging at lower temperatures, which are not high enough to remove residual smaller (i.e., migratable) PFAS molecules. Under certain conditions, the smaller PFAS "sidechain" can detach from the polymerized molecule. As a result, there may be potential for PFAS migration to food from this use.

<Take away>
FDA is aware of how much PFAS enters food from these PFAS uses.

US FDA webpage snippet (available at: https://www.fda.gov/food/chemical-contaminants-food/and-polyfluoroalkyl-substances-pfas) on the presence of PFAS in our food supply



Testing Foods & Assessing Safety | Analytical Results | Authorized PFAS | Q&A | Announcements

Per- and polyfluoroalkyl substances (PFAS) are a diverse group of human-made chemicals used in a wide range of consumer and industrial products. PFAS do not easily breakdown and some types have been shown to accumulate in the environment and in our bodies. Exposure to some types PFAS have been linked to serious health effects.

Through the FDA's testing of foods grown or produced in areas with known environmental PFAS contamination, it's clear that PFAS in the soil, water, or air can be absorbed by plants and animals, leading to contaminated foods. However, the FDA's testing of a wide range of foods from the general food supply collected for the Total Diet Study (TDS) has found that overall very few samples have detectable PFAS and those that do, have low levels. In 2022, we conducted a targeted seafood survey and in the limited samples tested we found more types of PFAS and higher levels compared with the fresh and processed foods tested in the TDS samples. We are working to better understand PFAS in seafood, as well as foods in general, to reduce dietary exposure to PFAS that may pose a health concern and will take actions as appropriate to ensure the continued safety of the U.S. food supply.

<Take away>
Only very recently (2019) did FDA start routine sampling for PFAS in their Total Diet Study. Few samples have reported PFAS and they reported low concentrations but there are too few data to draw strong conclusions. FDA commented that without established reference values from EPA it is difficult to know the potential for health effects based on these findings.

PFAS-pesticides in context of all pesticides -*how many pesticides are PFAS by definition?*

Note: this is repeat information but answers a question from a recent board meeting. In spring 2022, the pesticide product registry database (NSPIRS) was queried to determine how many registered products are likely to be affected by the newer definition of PFAS. This list is subject to change as Maine state agencies further refine the interpretation of the statutory PFAS definition. Each of the 69 actives in this list have some level of fluorination but staff are still seeking input from other agencies for a final determination. BPC does not currently have an official list of PFAS pesticides.

Table 1. List of active ingredient chemistries to be potentially classified as PFAS.

Chemical Name	CAS Number	Number of Registered Products
1-Methyl-3-phenyl-5-(3-(trifluoromethyl)phenyl)-4-pyridone aka fluridone	59756-60-4	8
Acifluorfen-sodium	62476-59-9	1
Benfluralin	1861-40-1	6
Benzovindiflupyr	1072957-71-1	7
Bicyclopyrone	352010-68-5	4
Bifenthrin	82657-04-3	247
Bixafen	581809-46-3	1
Broflanilide	1207727-04-5	4
Bromethalin	63333-35-7	65
Carfentrazone-ethyl	128639-02-1	31
Chlorfenapyr	122453-73-0	8
Cyflufenamid	180409-60-3	1
Cyflumetofen	400882-07-7	2
γ-Cyhalothrin	76703-62-3	24
λ-Cyhalothrin	91465-08-6	127
Dithiopyr	97886-45-8	113
Fipronil	120068-37-3	212
Fluazifop-P-butyl	79241-46-6	43
Fludioxonil	131341-86-1	38
Fluensulfone	318290-98-1	2
Flufenacet	142459-58-3	1
Fluindapyr	1383809-87-7	1
Fluopicolide	239110-15-7	2
Fluopyram	658066-35-4	12
Flupyradifurone	951659-40-8	4
Flurprimidol	56425-91-3	6
Flutolanil	66332-96-5	5
Fluvalinate	69409-94-5	11

Fluxapyroxad	907204-31-3	16
Fomesafen	72178-02-0	4
Fomesafen-sodium	108731-70-0	11
Hexaflumuron	86479-06-3	2
Hydramethylnon	67485-29-4	19
Indoxacarb	173584-44-6	33
Inpyrfluxam	1352994-67-2	2
Lactofen	77501-63-4	1
Mefentrifluconazole	1417782-03-6	6
N-Ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl) benzenamine	55283-68-6	3
Norflurazon	27314-13-2	1
Novaluron	116714-46-6	19
Noviflumuron	121451-02-3	4
Oxathiapiprolin	1003318-67-9	6
Oxyfluorfen	42874-03-3	19
Penoxsulam	219714-96-2	11
Penthiopyrad	183675-82-3	5
Picoxystrobin	117428-22-5	3
Prodiamine	29091-21-2	69
Prosulfuron	94125-34-5	1
Pydiflumetofen	1228284-64-7	9
Pyraflufen-ethyl	129630-19-9	5
Pyrasulfotole	365400-11-9	2
Pyridalyl	179101-81-6	2
Pyrifluquinazon	337458-27-2	2
Pyrimisulfan	221205-90-9	2
Pyroxasulfone	447399-55-5	20
Saflufenacil	372137-35-4	7
Sedaxane	874967-67-6	8
Sulfentrazone	122836-35-5	76
Tefluthrin	79538-32-2	4
Tembotrione	335104-84-2	3
Tetraconazole	112281-77-3	12
Tetraniliprole	1229654-66-3	1
Tiafenacil	1220411-29-9	1
Tralopyril	122454-29-9	66
Trifloxystrobin	141517-21-7	19
Triflumizole	68694-11-1	4
Trifluralin	1582-09-8	28
Triflusulfuron-methyl	126535-15-7	1
	Total products	1,493
	Active Ingredients	69

PFAS-inerts -*are any inerts that are known to be PFAS?*

In September EPA announced the removal of 12 compounds from the pesticide inerts list due to their chemical structure[3]. EPA allows manufacturers to use any of the compounds off the inerts list in their formulations without additional testing or risk assessment. The inerts list also delineates which compounds may be used on food-use products and which may not. The inerts list is available at: https://www.epa.gov/pesticide-registration/inert-ingredients-overview-and-guidance. Removal of these 12 ingredients does not change the availability or registration of any products in Maine because these 12 compounds were not in use according to EPA records. EPA has previously signaled its desire to "clean up" the inerts list and remove compounds no longer in use and this action is consistent with that intention. When asked, during a call with the states, EPA indicated there are other PFAS compounds still in use. As a reminder, EPA uses a two-carbon chain definition of PFAS that is less restrictive than the state of Maine's definition.

The state of Maine has not previously collected ingredient or formulation information from manufacturers. All compounds not considered to have pesticidal activity are allowed to be kept as confidential business information. Starting with the 2023 registration year Maine will collect that information from registrants during pesticide product renewal and new product registration. Additionally, the legislatively mandated affidavit collection also commences in the 2023 registration year. One affidavit will indicate if a product does or does not contain any PFAS ingredients in accordance with the state's definition. Another affidavit will indicate if a product has been stored in a fluorinated container. The affidavit data will be available in mid-spring of 2023.

PFAS-contamination of pesticides -*how widespread is PFAS contamination in pesticides?*

A recently published paper identified PFAS compounds in commonly used insecticide products.[4] Researchers found quantifiable PFAS in six out of ten products with one method and seven out of ten products with a secondary method, previously used at a research farm in Texas, see attached paper for details. The one PFAS that was present repeatedly in products at a level of quantification was PFOS. The PFOS had an analytical pattern and was mixed with other certain types of PFAS indicating a specific manufacturing method for the PFOS which has not been allowed in the US for many years. This study also looked at soil, water, and plants grown in the area where the products were used. Soil samples seemed to indicate multiple sources of contamination meaning more than the insecticide use caused the presence of PFOS. The plant samples had several PFAS in them that did not correlate to the PFAS in the insecticides. The authors thought that the PFOS in the plant tissue could come from the insecticides but that there were five additional PFAS present with unknown origins in the plants.

This study is finding PFOS in pesticides at concentrations that are an order of magnitude higher than in

Table 1
Average concentration of PFOS in the analyzed insecticide formulations (mg PFAS/kg formulation or ppm, ± standard deviation). The concentrations reported were calculated from the dilution described previously in the "Insecticide Analysis section". PFAS with no concentrations above LOQ were not included in this table.

Sample ID	Formulation type	Active ingredient	PFOS (mg/kg)
1	Liquid concentrate	Abamectin	3.92 ± 0.51
2	Emulsified suspension	Novaluron	9.18 ± 0.34
3	Liquid concentrate	Mineral Oil (Petroleum oil)	8.64 ± 0.67
4	Emulsified suspension	Imidacloprid	13.3 ± 1.4
5	Emulsified suspension	Spiromesifen	19.2 ± 1.2
6	Liquid concentrate	Malathion	17.8 ± 0.7
7	Wettable powder	*Beauveria Bassiana*	0
8	Wettable powder	Pyridalyl	0
9	Emulsified suspension	Spinosad	0
10	Wettable powder	Spinetoram, Sulfoxaflor	0
BLANK			0

previous work with pesticides. Another difference to note, EPA's previous work found eight PFAS compounds adulterating a mosquito insecticide product but did not find reportable levels of PFOS.

Citations

[1] EPA Container Leaching Study available at: https://www.epa.gov/system/files/documents/2022-09/EPA%20PFAS%20Container%20Leaching%20Study%2008122022_0.pdf

[2] Personal communication with M. Hudson, Executive Director of the Ag Container Recycling Council (ACRC) https://www.agrecycling.org/

[3] EPA press release PFAS inert ingredients withdrawn. https://www.epa.gov/newsreleases/epa-proposes-stop-authorized-use-certain-pfas-pesticide-products

[4] Steven Lasee, Kaylin McDermett, Naveen Kumar, Jennifer Guelfo, Paxton Payton, Zhao Yang, Todd A. Anderson. 2022. Targeted analysis and Total Oxidizable Precursor assay of several insecticides for PFAS. Journal of Hazardous Materials Letters 3 (2022) 100067. https://doi.org/10.1016/j.hazl.2022.100067

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE of CHEMICAL SAFETY AND POLLUTION PREVENTION
OFFICE of PESTICIDE PROGRAMS

Analytical Chemistry Branch
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August 12, 2022

MEMORANDUM

SUBJECT: Results of EPA's Analytical Chemistry Branch Laboratory Study of PFAS Leaching from Fluorinated HDPE Containers.
ACB Project B21-02

FROM: Thuy Nguyen, Chief
Analytical Chemistry Branch
Biological and Economic Analysis Division

To: Anne Overstreet, Acting Director
Biological and Economic Analysis Division
EPA Office of Pesticide Programs

BACKGROUND and SUMMARY

In March 2021, the Agency released data on a study titled "Rinses From Selected Fluorinated and Non-Fluorinated HDPE Containers". Based on that study, the Analytical Chemistry Branch (ACB) concluded that tested fluorinated high density polyethylene (HDPE) containers have certain perfluorinated alkyl substances (PFAS) on/in their walls, and that those PFAS compounds can leach into the liquid products (mosquito control products) stored in those containers.

In this current study, the ACB tested the impact of other variables - specifically the length of time a pesticide product is stored in fluorinated and non-fluorinated polyethylene containers, and the different types of liquid (such as water and methanol) used in the product - on the leaching potential of PFAS. Thirty-one (31) PFAS compounds (see **Attachment I**) were targeted in this study, using a modified EPA Method 537.1 . This study was not designed to provide any quantitative data for assessing risk of PFAS leaching from fluorinated HDPE containers into the liquid products that stored in such containers.

ACB purchased several brands of clean/never used before fluorinated and non-fluorinated containers from the open market in the spring and summer of 2021. These fluorinated and non-fluorinated containers were tested at different time intervals (up to twenty weeks) for simulated stored products containing methanol or water. Results show that in all fluorinated containers tested, higher levels of total PFAS were found in the methanol (up to ~ 15 ppb) and water (up to ~3 ppb) leachates

compared to that from non-fluorinated container leachate, whereas the highest total level of PFAS found is about 0.04 ppb, which is similar to the laboratory background levels commonly encountered.

STUDY DESIGN

The ACB conducted a study to evaluate the leaching potential of PFAS from fluorinated container walls into simulated liquid pesticide products stored in these containers. Most of the liquid pesticide products are formulated aqueous solutions with surfactants, and some products are formulated with organic solutions (e.g., oil, organic solvents). Water and methanol were chosen in this study to represent the latter types of products, with water being the weakest solution and methanol representing the strongest solution that can leach PFAS from the container walls. Aqueous solutions with surfactants should have stronger ability than water alone, because of the hydrophobicity properties of the surfactants, in leaching PFAS from container walls.

Three different brands of fluorinated polyethylene containers were used (see **Table 1**). For Brand B and Brand C, two containers each were filled to capacity, one with high purity water, one with methanol, and used for the entire length of the study. For Brand A, due to small container size, two containers (one for water, one for methanol) were used for each time point. All containers were left on the counter in a laboratory away from direct sunlight at room temperature. An aliquot of the solutions (200 ml) was taken at each time point from each container. The aliquots, either water or methanol, were processed and analyzed for presence of thirty-one PFAS compounds (see Appendix I), using the same modified EPA Method 537.1, as described in the Agency's March 2021 data release. The methanol samples were concentrated and reconstituted to 1 ml of final solutions and then analyzed using the same instrumental method as for the water samples. Procedural blanks and fortified blanks were used at each sampling period as analytical quality controls.

Non-fluorinated HDPE containers were also filled with water or methanol and aliquots of the solutions were taken and analyzed at the same time along with those from the fluorinated containers for comparison.

Table 1. HDPE containers used in the leaching study and the sampling scheme.

Containers tested	**Leaching solution**	**Sampling period after filling up with liquid** (one sample at each time point)
Brand A, nonfluorinated 250 ml HDPE	Water, 1 bottle per time point	1 day, 1 week, 4 weeks, 10 weeks, 20 weeks
	Methanol, 1 bottle per time point	
Brand A, fluorinated 250 ml FLPE *	Water, 1 bottle per time point	1 day, 1 week, 4 weeks, 10 weeks, 20 weeks
	Methanol, 1 bottle per time point	
Brand B, fluorinated 1 gal HDPE	Water, 1 piece	1 day, 1 week, 4 weeks, 10 weeks, 20 weeks
	Methanol, 1 piece	
Brand C, fluorinated 2.5 gal HDPE	Water, 1 piece Methanol, 1 piece	1 day, 1 week, 4 weeks, 10 weeks, 20 weeks

* FLPE: Fluorinated High Density Polyethylene. The fluorination technology or fluorination degrees of these containers are unknown.

RESULTS

Eight out of the thirty-one PFAS compounds that were targeted in the analytical method were positively identified in the water and methanol samples of all the fluorinated containers and are listed in **Table 2**. These same eight compounds were also identified in the ACB March 2021 rinse study.

Table 2. List of PFAS compounds that were positively identified in the leachates of the fluorinated HDPE containers.

Abbreviated name	***Full name***
PFBA	*Perfluoro-butanoic acid*
PFPeA	*Perfluoro-pentanoic acid*
PFHxA	*Perfluoro-hexanoic acid*
PFHpA	*Perfluoro-heptanoic acid*
PFOA	*Perfluoro-octanoic acid*
PFNA	*Perfluoro-nananoic acid*
PFDA	*Perfluoro-decanoic acid*
PFUdA	*Perfluoro-undecanoic acid*

The summation (total of the concentrations) of the eight identified PFAS compounds in the water and methanol leachates are listed in **Tables 3 and 4**, respectively. The values are in ng/ml (or ppb) of water or methanol in the containers.

Table 3. Total PFAS concentration (ng/ml of water (ppb), summation of detected PFAS compounds) in water leachates at different storage time points of non-fluorinated and fluorinated containers.

Containers	**1 day**	**1 week**	**4 weeks**	**10 weeks**	**20 weeks**
Brand A, Non-fluorinated	0.003	0.021	0.001	0.002	0.000
Brand A, Fluorinated	0.092	0.335	1.115	2.467	2.888
Brand B, Fluorinated	0.103	0.393	0.391	0.677	0.654
Brand C, Fluorinated	0.016	0.131	0.276	0.697	0.907

Table 4. Total PFAS concentration (ng/ml of methanol (ppb), summation of detected PFAS compounds) in methanol leachates at different storage time points of non-fluorinated and fluorinated containers.

Containers	1 day	1 week	4 weeks	10 weeks	20 weeks
Brand A, Non-fluorinated	0.014	0.009	0.014	0.045	0.022
Brand A, Fluorinated	8.184	6.065	1.238	14.720	4.970
Brand B, Fluorinated	0.977	0.967	1.035	1.541	3.120
Brand C, Fluorinated	1.026	0.614	0.980	1.489	1.896

Figures 1 and 2 are graphic displays of the PFAS levels found in water and methanol leachates from tested containers, with some notable observations

- Water or methanol stored in fluorinated containers have elevated PFAS levels, a clear indication of the migration (leaching) of PFAS from container walls to the liquid solutions in the container.
- The total (summation) amount of leached PFAS at each time point is different for different brands of fluorinated containers, likely a reflection of different fluorination degree and technology of these containers.
- The amount of PFAS leached into the solutions generally increases with time during the 20-week testing period, indicating continued gradual leaching over time.
- Higher amount of PFAS was found in methanol solution (up to 15 ppb total, week 10) than that in water (up to 3 ppb total, week 20) of the same containers, an observation consistent with that of methanol being a stronger solvent in dissolving organic compounds, thus a stronger solution in leaching of PFAS from the HDPE container walls.
- The leaching rate with methanol is much faster than with water as shown by the high PFAS concentrations in the methanol from day one of the tests.
- The highest level of PFAS from the non-fluorinated containers is 0.045 ppb in methanol leachate. This detection is likely derived from laboratory equipment and reagents and is believed to reflect background levels.

Figure 1. Amount of PFAS in water stored in fluorinated HDPE containers over time. A non-fluorinated container was used as comparison.

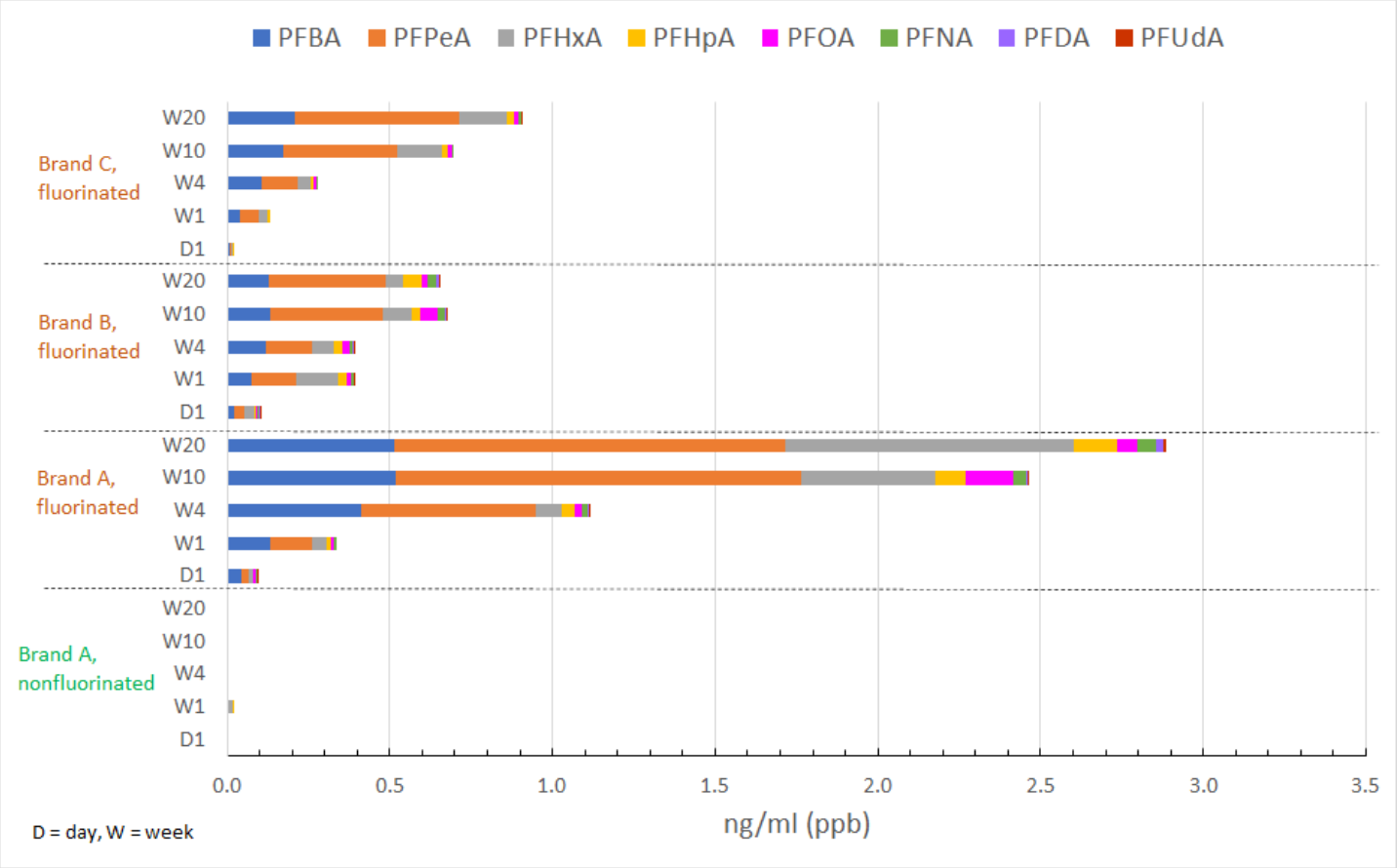
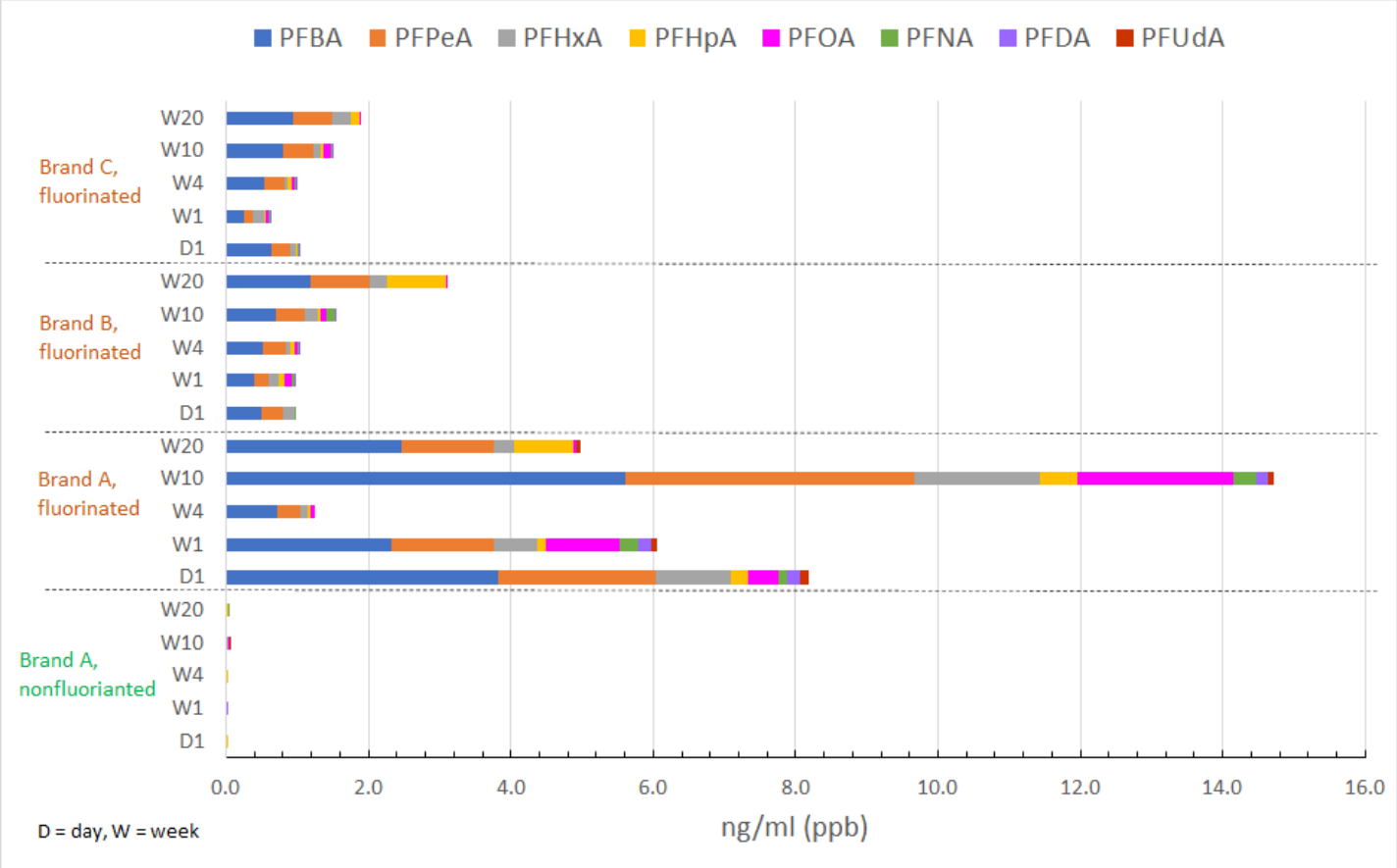


Figure 2. Amount of PFAS in methanol stored in fluorinated HDPE containers over time. A non-fluorinated container was used as comparison. The amount of PFAS leached into methanol from one brand of container, although elevated, showed a random pattern of amount leached over time. Individual containers (250 ml size) were used for each time point and the variations among different container replicates may have contributed to the difference in the leached amount for this brand.



SIGNIFICANCE and LIMITATION OF THE STUDY RESULTS

As demonstrated in previous rinse study (March 2021), PFAS, which were formed as by-products during the fluorination process of HDPE containers, do leach from container walls into the products they contain. This study further demonstrates that the amount of PFAS leached into the products will increase over storage time in these types of fluorinated containers. Furthermore, the stronger the solvent in which the product is formulated, the higher the amount of PFAS leached. The amount of PFAS leached varies with the brands of containers, likely a reflection of different fluorination degree and technology used for each container.

The agency is aware that there are different fluorination technologies for the HDPE containers. Because the tested containers were purchased from open market, the fluorination technologies used for these tested containers are unknown to the agency. It is unclear at this time if PFAS would be present in all fluorinated containers treated by different fluorination technologies. Additional tests may be needed on fluorinated containers from different fluorination technologies to verify if PFAS would be present in those containers.

Attachment I – Targeted PFAS and their CAS numbers

Cc: Neil Anderson
Yan Liang
Yaorong Qian

ATTACHMENT I - TARGETED PFAS

CHEMICAL ABSTRACTS SERVICE (CAS) REGISTRY NUMBERS and CHEMICAL NAMES
PFAS: Per- and polyfluoroalkyl substances

	CAS #	Full Name
PFBA	375-22-4	Perfluorobutanoic Acid
PFBS	375-73-5	Perfluorobutanesulfonic Acid
PFPeA	2706-90-3	Perfluoropentanoic Acid
PFPeS	2706-91-4	Perfluoropentanesulfonic Acid
PFHxA	307-24-4	Perfluorohexanoic Acid
PFHxS	355-46-4	Perfluorohexanesulfonic Acid
PFHpA	375-85-9	Perfluoroheptanoic Acid
PFHpS	375-92-8	Perfluoroheptanesulfonic Acid
PFOA	335-67-1	Perfluorooctanoic Acid
PFOS	1763-23-1	Perfluorooctanesulfonic Acid
PFNA	375-95-1	Perflurononanoic Acid
PFNS	68259-12-1	Perfluorononanesulfonic Acid
PFDA	375-76-2	Perfluorodecanoic Acid
PFDS	335-77-3	Perfluorodecanesulfonic Acid
PFUdA/PFUnA	2058-94-8	Perfluoroundecanoic Acid
PFDoA	307-55-1	Perfluorododecanoic Acid
PFDoS	70780-39-5	Perfluorododecanesulfonic Acid
PFTrDA	72629-94-8	Perfluorotridecanoic Acid
PFTeDA	376-06-7	Perfluorotetradecanoic Acid
PFHxDA	67905-19-5	Perflurohexadecanoic Acid
PFODA	16517-11-6	Perfluorooctadecanoic Acid
4:2 FTS	27619-93-8	Perfluorohexane sulfonate (4:2)
6:2 FTS	27619-94-9	Perfluorooctane sulfonate (6:2)
8:2 FTS	27619-96-1	Perfluorodecane sulfonate (8:2)
FOSAA	2806-24-8	Perfluorooctane sulfonamidoacetic Acid
N-MeFOSAA	2355-31-9	N-Methyl Perfluorooctane sulfonoamidoacetic Acid
N-EtFOSAA	2991-50-6	N-Ethyl Perfluorooctane sulfonoamidoacetic Acid
HFPO-DA	13252-13-6	GenX; 2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid
NaDONA	958445-44-8	Sodium dodecafluoro-3H-4,8-dioxanonanoate
9Cl-PF3ONS	73606-19-6	Potassium 9-chlorohexadecafluoro-3-oxanonane-1-sulfonate
11Cl-PF3OUdS	83329-89-9	Potassium 11-chloroeicosafluoro-3-oxaundecane-1-sulfonate

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY
BOARD OF PESTICIDES CONTROL
28 STATE HOUSE STATION
AUGUSTA, MAINE 04333

JANET T. MILLS
GOVERNOR

AMANDA E. BEAL
COMMISSIONER

5b

August 29, 2022

Jeremy Legasse
Green Thumb Lawn Service
64 Stevens Rd
Brewer, Maine 04412

RE: Variance permit for CMR 01-026 Chapter 29, Green Thumb Lawn Services

Dear Mr. Legasse,

On November 18, 2011, the Board authorized the staff to issue permits for broadcast pesticide applications within 25 feet of water for control of plants that pose a dermal toxicity hazard. On December 13, 2013, the Board authorized the staff to issue multi-year permits for broadcast pesticide applications within 25 feet of water for control of invasive plants provided the applicator has demonstrated knowledge of best management practices for control of the plant and has a re-vegetation plan for the site.

By way of this letter, your request for a variance from the 25-foot setback requirement contained in Chapter 29, Section 6 is hereby granted for the treatment of a poison ivy infestation near Davis Pond. This variance is valid until December 31, 2023. Please bear in mind that your permit is based upon your company adhering to the precautions listed in Section X of your variance application; also, the Board does require that you notify them if there is a change in products to be used.

We will alert the Board at its October 21, 2022 meeting that the variance permit has been issued. If you have any questions concerning this matter, please feel free to contact me at 287-2731.

Sincerely,

E. Ann Gibbs

Ann Gibbs, Director
Division of Animal and Plant Health

MEGAN PATTERSON, DIRECTOR
90 BLOSSOM LANE, DEERING BUILDING

DEPARTMENT OF Agriculture Conservation & Forestry

PHONE: (207) 287-2731
THINKFIRSTSPRAYLAST.ORG

BOARD OF PESTICIDES CONTROL
APPLICATION FOR VARIANCE PERMIT
(Pursuant to Chapter 29, Section 6 of the Board's Regulations)

I.

Jeremy Legasse		(207) 989-1433	
Name		Telephone Number	
Green Thumb Lawn Service			
Company Name			
64 Stevens Road	Brewer	ME	04412
Address	City	State	Zip

II.

Jeremy Legasse		CMA-3240 7E, 7A, 6B, 3B, 3A	
Master Applicator (if applicable)		License Number	
36 Aspen Way	Brewer	ME	04412
Address	City	State	Zip

III. **As part of your application, please send a revegetation plan and digital photos showing the target site and/or plants and the surrounding area, particularly showing proximity to wetlands and water bodies, to pesticides@maine.gov**

IV. Area(s) where pesticide will be applied:

Aproximately 400 SQFT of frontage of Davis Pond.

V. Pesticide(s) to be applied:(Including EPA Registration Number)

Rodeo Herbicide: 62719-324

VI. Purpose of pesticide application:

To manage Poison Ivy

VII. Approximate dates of spray application:

Between July 4th - 15th

VIII. Application Equipment:

Low Pressure Hand Held Pump Tank

IX. Standard(s) to be varied from:

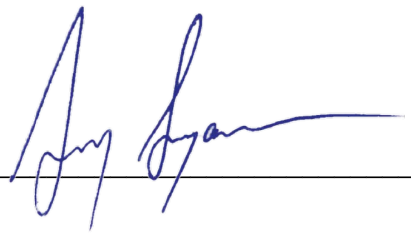
Within 25' of open water (Davis Pond)

X. Method to ensure equivalent protection:

We will be treating on a day with minimal wind and using a low pressure hand can sprayer. This will be a spot treatment only for the patches of ivy that is present

XI. Revegetation Plan (attach separately if necessary)

Natural recovery

Signed:  Date: 06/28/2022

Return completed form to: **Board of Pesticides Control, 28 State House Station, Augusta, ME 04333-0028**
OR E-mail to: pesticides@maine.gov

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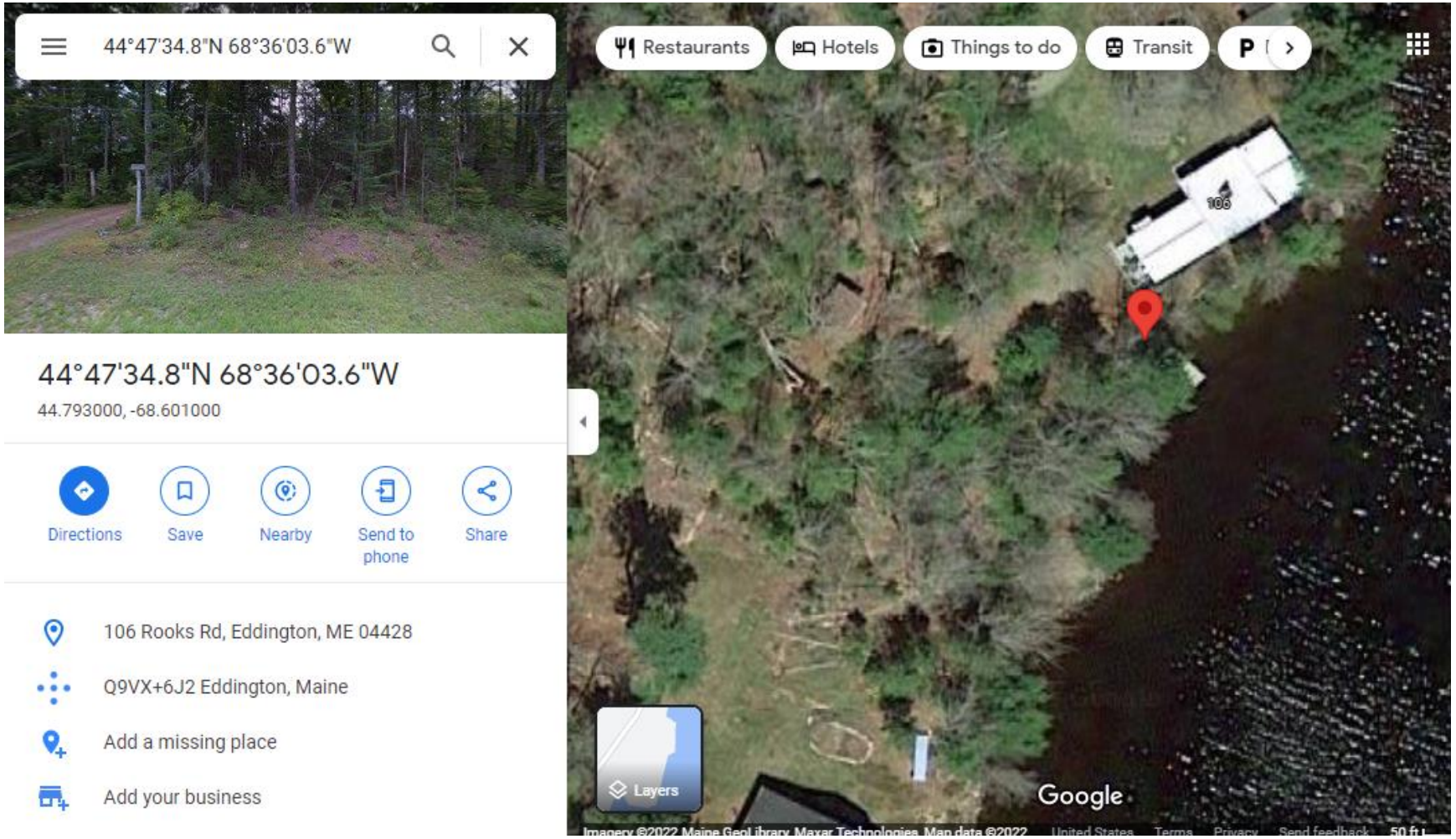
44°47'34.8"N 68°36'03.6"W
Restaurants
Hotels
Things to do
Transit
44°47'34.8"N 68°36'03.6"W
44.793000, -68.601000
Directions
Save
Nearby
Send to phone
Share
106 Rooks Rd, Eddington, ME 04428
Q9VX+6J2 Eddington, Maine
Add a missing place
Add your business
106
Layers
Google
Imagery ©2022 Maine GeoLibrary, Maxar Technologies, Map data ©2022
United States
Terms
Privacy
Send feedback
50 ft

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY
BOARD OF PESTICIDES CONTROL
28 STATE HOUSE STATION
AUGUSTA, MAINE 04333

JANET T. MILLS
GOVERNOR

AMANDA E. BEAL
COMMISSIONER

5c

September 2, 2022

Jeremy Legasse
Green Thumb Lawn Service
64 Stevens Rd
Brewer, Maine 04412

RE: Variance permit for CMR 01-026 Chapter 29, Green Thumb Lawn Services

Dear Mr. Legasse,

On November 18, 2011, the Board authorized the staff to issue permits for broadcast pesticide applications within 25 feet of water for control of plants that pose a dermal toxicity hazard. On December 13, 2013, the Board authorized the staff to issue multi-year permits for broadcast pesticide applications within 25 feet of water for control of invasive plants provided the applicator has demonstrated knowledge of best management practices for control of the plant and has a re-vegetation plan for the site.

By way of this letter, your request for a variance from the 25-foot setback requirement contained in Chapter 29, Section 6 is hereby granted for the treatment of a poison ivy infestation near Pushaw Lake. This variance is valid until December 31, 2023. Please bear in mind that your permit is based upon your company adhering to the precautions listed in Section X of your variance application; also, the Board does require that you notify them if there is a change in products to be used.

We will alert the Board at its October 21, 2022 meeting that the variance permit has been issued. If you have any questions concerning this matter, please feel free to contact me at 287-2731.

Sincerely,

E. Ann Gibbs

Ann Gibbs, Director
Division of Animal and Plant Health
Dept. of Agriculture, Conservation & Forestry

MEGAN PATTERSON, DIRECTOR
90 BLOSSOM LANE, DEERING BUILDING

maine DEPARTMENT OF Agriculture Conservation & Forestry

PHONE: (207) 287-2731
THINKFIRSTSPRAYLAST.ORG

BOARD OF PESTICIDES CONTROL
APPLICATION FOR VARIANCE PERMIT
(Pursuant to Chapter 29, Section 6 of the Board's Regulations)

I. Jeremy Legasse (207)989-1433
Name Telephone Number

Green Thumb Lawn Service
Company Name

64 Stevens Rd Brewer ME 04412
Address City State Zip

II. Jeremy Legasse CMA-3240 7E, 7A, 6B, 3B, 3A
Master Applicator (if applicable) License Number

36 Aspen Way Brewer ME 04412
Address City State Zip

III. **As part of your application, please send a revegetation plan and digital photos showing the target site and/or plants and the surrounding area, particularly showing proximity to wetlands and water bodies, to pesticides@maine.gov**

IV. Area(s) where pesticide will be applied:
Bryan Stanley. 169 Ata Landing Rd, Glenburn, ME 04401
Approx. 300sqft of frontage on Pushaw Lake

V. Pesticide(s) to be applied:(Including EPA Registration Number)

Rodeo Herbicide 62719-324

VI. Purpose of pesticide application:
To manage poison ivy

VII. Approximate dates of spray application:
Between Sept 1 - Sept 15, 2022

VIII. Application Equipment:

Low pressure Hand Held Pump Tank

IX. Standard(s) to be varied from:

within 25' from open water (Pushaw Lake)

X. Method to ensure equivalent protection:
We will be treating on a day with minimual wind and using a low pressure hand can sprayer. This will be a spot treatment only for the patches of ivy that is present.

XI. Revegetation Plan (attach separately if necessary)

Natural revegetation

Signed: [signature] Date: 8.30.2022

Return completed form to: **Board of Pesticides Control, 28 State House Station, Augusta, ME 04333-0028**
OR E-mail to: pesticides@maine.gov

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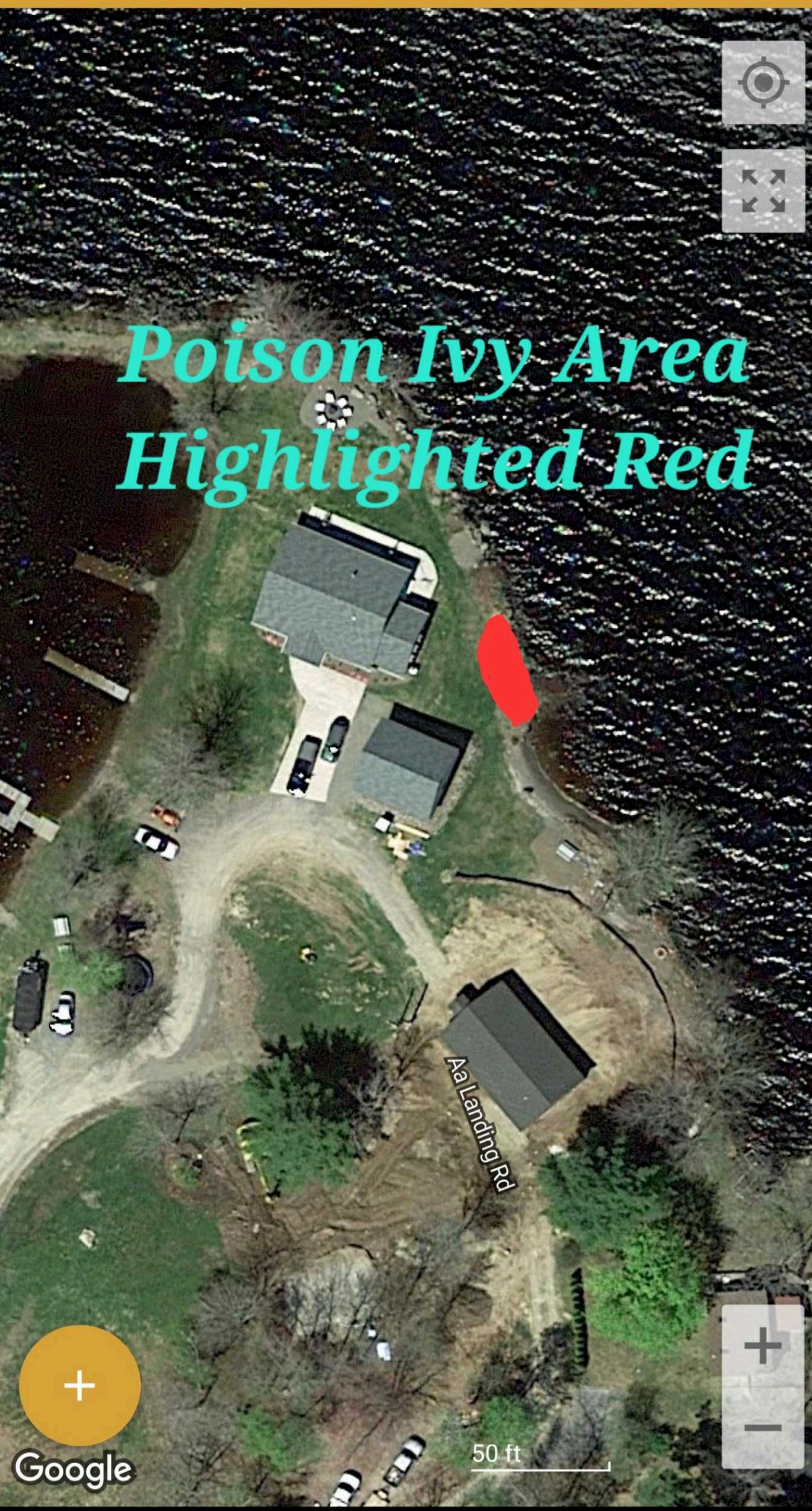
Poison Ivy Area
Highlighted Red
Aa Landing Rd
50 ft
Google


Distance: 698.894 ft
Shoreline @ AA Landing Road
Aa Landing Rd
Google

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY
BOARD OF PESTICIDES CONTROL
28 STATE HOUSE STATION
AUGUSTA, MAINE 04333

JANET T. MILLS
GOVERNOR

AMANDA E. BEAL
COMMISSIONER

5d

September 12, 2022

Jeremy Legasse
Green Thumb Lawn Service
64 Stevens Rd
Brewer, Maine 04412

RE: Variance permit for CMR 01-026 Chapter 29, Green Thumb Lawn Services

Dear Mr. Legasse,

On November 18, 2011, the Board authorized the staff to issue permits for broadcast pesticide applications within 25 feet of water for control of plants that pose a dermal toxicity hazard. On December 13, 2013, the Board authorized the staff to issue multi-year permits for broadcast pesticide applications within 25 feet of water for control of invasive plants provided the applicator has demonstrated knowledge of best management practices for control of the plant and has a re-vegetation plan for the site.

By way of this letter, your request for a variance from the 25-foot setback requirement contained in Chapter 29, Section 6 is hereby granted for the treatment of a poison ivy infestation at the Cooke property in Southport on the coast. This variance is valid until December 31, 2023. Please bear in mind that your permit is based upon your company adhering to the precautions listed in Section X of your variance application; also, the Board does require that you notify them if there is a change in products to be used.

We will alert the Board at its October 21, 2022 meeting that the variance permit has been issued. If you have any questions concerning this matter, please feel free to contact me at 287-2731.

Sincerely,

E. Ann Gibbs

Ann Gibbs, Director
Division of Animal and Plant Health
Dept. of Agriculture, Conservation & Forestry

MEGAN PATTERSON, DIRECTOR
90 BLOSSOM LANE, DEERING BUILDING

PHONE: (207) 287-2731
THINKFIRSTSPRAYLAST.ORG

BOARD OF PESTICIDES CONTROL
APPLICATION FOR VARIANCE PERMIT
(Pursuant to Chapter 29, Section 6 of the Board's Regulations)

I. John Cooke (410) 279-7750
Name Telephone Number

Company Name

40 Town Landing Road Newagen ME 04576
Address City State Zip

II. Jeremy Legasse CMA-3240 7E, 7A, 6B, 3B, 3A
Michael Legasse CMA-3210
Master Applicator (if applicable) License Number

64 Stevens Road, Brewer ME 04412
Address City State Zip

III. **As part of your application, please send a revegetation plan and digital photos showing the target site and/or plants and the surrounding area, particularly showing proximity to wetlands and water bodies, to pesticides@maine.gov**

IV. Area(s) where pesticide will be applied:

Area boardering between deck facing water is a vegetative transition to rock shoreline and the ocean.

V. Pesticide(s) to be applied:(Including EPA Registration Number)

AquaMaster EPA #: 524-343

VI. Purpose of pesticide application:
Noxious weeds

To manage clients Poison Ivy next to their deck.

VII. Approximate dates of spray application:

9/9/2022 - 9/12/2022

VIII. Application Equipment:

Low Pressure Hand Held Pump Tank

IX. Standard(s) to be varied from:

Within 25' of open water (Ocean)

X. Method to ensure equivalent protection:

We will be treating on a day with minimal wind projected in the forecast. Using Low Pressure sprayer and spot treating Poison Ivy selectivly.

XI. Revegetation Plan (attach separately if necessary)

Natural recovery

Signed: _____ Date: 9/8/2022

Return completed form to: **Board of Pesticides Control, 28 State House Station, Augusta, ME 04333-0028**
OR E-mail to: pesticides@maine.gov

Rev. 8/2013

Board Member Remote Participation Policy

POLICY: In accordance with 1 M.R.S. § 403-B, it is the policy of the Board of Pesticides Control ("Board") to allow Board members to participate remotely using synchronous telephonic or video technology allowing simultaneous reception and exchange of information pursuant to this policy.

1. It is an expectation that all members of the Board will be physically present for public proceedings conducted by the Board except when being physically present is not practicable.

2. Circumstances in which the physical presence of one or more of the members of the Board is not practicable include:

A. The existence of an emergency or urgent issue that requires the Board to meet by remote methods. The existence of an emergency or urgent issue under this subsection shall be determined by the Board Chair, or if the Chair is unavailable, by the Director.

B. Illness or other physical condition as determined by the individual Board member that causes the member to face significant difficulties to travel to or attend the public Board proceeding.

C. Temporary absence from the State that would cause the Board member to face significant difficulties traveling to and attending the public Board proceeding in person as determined by the individual Board member.

D. Whenever a member of the Board has to travel a significant distance to be physically present at the public Board proceeding.

E. Whenever there are geographic characteristics or meteorological conditions that impede safety or slow travel, including but not limited to islands not connected by bridges or significant weather events such as hurricanes, snowstorms, ice storms or nor'easters. The existence of geographic characteristics or meteorological conditions that impede safety or slow travel under this subsection shall be determined by the Board Chair, or if the Chair is unavailable, by the Director.

3. The Board shall provide members of the public a meaningful opportunity to attend a public proceeding of the Board by remote means whenever members of the Board participate by remote methods or when necessary to provide reasonable accommodation and access to individuals with disabilities. Any member of the public needing and requesting accommodation to access a public Board proceeding should contact Board staff via the main phone line at (207)287-2731 or pesticides@maine.gov.

4. Whenever the Board is scheduled to allow or required to provide an opportunity for public input during a public Board proceeding, the Board shall provide an effective means of communication between the members of the Board and the public.

5. Whenever a member of the Board will be participating remotely, the Board's notice of the public Board proceeding will include the means by which members of the public may access the proceeding remotely and identify a physical location for members of the public to attend in person. The Board may not limit the public's ability to attend a public proceeding in person except during the existence of an emergency or urgent issue or there are geographic characteristics or meteorological conditions that impede safety or slow travel that requires the Board to meet by remote methods.

6. A member of the Board who participates remotely in a public Board proceeding is present for purposes of a quorum and voting.

7. All votes taken by the Board during a public Board proceeding using remote methods for participation by any Board member must be taken by roll call vote that can be seen and heard if using video technology, and heard if using audio only technology, by the other members of the Board and the public.

8. The Board shall make all non-confidential documents and other materials, electronic or otherwise, considered by it during a public proceeding available to the public who attend by remote means to the same extent customarily available to members of the public who attend Board public proceedings in person so long as no additional costs are incurred by the Board.

9. For purposes of adjudicatory hearings held under 5 M.R.S. §§ 9051-9064, only Board members who participate via video methods that allows the parties to the proceeding the ability to view the remotely participating member will be allowed to participate in the proceeding.

10. Nothing in this policy is intended to be a rule subject to the provisions of 5 M.R.S. §§ 8051-8074, and this policy may be subsequently amended by simple majority vote of those present and voting once quorum is achieved.

EFFECTIVE DATE: AUGUST 16, 2021

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY
BOARD OF PESTICIDES CONTROL
28 STATE HOUSE STATION
AUGUSTA, MAINE 04333

JANET T. MILLS
GOVERNOR

AMANDA E. BEAL
COMMISSIONER

MAINE BOARD OF PESTICIDES CONTROL POLICY ON EMERGENCY PERMITTING FOR NEONICOTINOIDS EXEMPTION

Adopted August 5, 2022

BACKGROUND

On August 5, 2021, the Board adopted Section 6 of Chapter 41 which limits the use of dinotefuran, clothianidin, imidacloprid, or thiamethoxam in outdoor residential landscapes to only certified private or commercial applicators. Further, these active ingredients may only be used for the management of emerging invasive invertebrate pests on ornamental vegetation or in emergency situations with an approved permit obtained from the Board. On February 18, 2022, the Board recommended compiling a list of approved emerging invasive invertebrate pests that meet this definition and to allow for permitting for use of neonicotinoids in emergency situations as outlined in CMR01-26 Chapter 51(VII)(B)(1).

POLICY

Any person who seeks a variance from rules in Chapter 41 Section 6 may only do so for emergency situations as outlined in CMR01-26 Chapter 51(VII)(B)(1).

An emergency situation exists if it:

- Involves the introduction or dissemination of a pest new to or not theretofore known to be widely prevalent or distributed within or throughout the United States and its territories; or
- Will present significant risks to human health; or
- Will present significant risks to threatened or endangered species, beneficial organisms, unique ecosystems or the environment; or
- Will cause significant economic loss due to:
  - an outbreak or an expected outbreak of a pest; or
  - a change in plant growth or development caused by unusual environmental conditions where such change can be rectified by the use of a pesticide(s).

Once an emergency situation is identified, applicators who wish to use neonicotinoids in residential landscapes must submit an emergency use permit to

the Board. The permit application must be submitted on forms provided by the Board and must include:

- The name, address and telephone number of the applicant;
- The brand name of the pesticides to be applied;
- The area(s) where pesticides will be applied;
- The purpose for which the pesticide application(s) will be made;
- The approximate application date(s);
- The type(s) of application equipment to be employed;
- The approved pest species for which the application is being made as defined in policy or by the Board; and
- The particular reasons why the applicant seeks a variance from the requirements of this section, including a detailed description of the techniques to be employed to assure that a reasonably equivalent degree of protection of surrounding nontarget vegetation will be obtained.

Within 30 days after a complete application is submitted, the Board or its staff shall issue a permit if it finds that the application meets requirements of CMR01-26 Chapter 41 Section 6 (E). The Board may place conditions on any such permit, and the applicant shall comply with such conditions. Except as required by the permit, the applicant shall undertake the application in accordance with all of the conditions described in their request and all other applicable legal standards. Permits issued by the Board under this section shall not be transferable or assignable except with further written approval of the Board and shall be valid only for the period specified in the permit.

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY
BOARD OF PESTICIDES CONTROL
28 STATE HOUSE STATION
AUGUSTA, MAINE 04333

5g

JANET T. MILLS
GOVERNOR

AMANDA E. BEAL
COMMISSIONER

MAINE BOARD OF PESTICIDES CONTROL POLICY ON APPROVED INVASIVE INVERTEBRATE PESTS ON ORNAMENTAL VEGETATION IN OUTDOOR RESIDENTIAL LANDSCAPES FOR NEONICOTINOIDS EXEMPTION

Adopted August 5, 2022

BACKGROUND

On August 5, 2021, the Board adopted Section 6 of Chapter 41 which limits the use of dinotefuran, clothianidin, imidacloprid, and thiamethoxam in outdoor residential landscapes to only certified private or commercial applicators. However, these active ingredients may be used for the management of emerging invasive invertebrate pests on ornamental vegetation or in emergency situations with an approved permit obtained from the Board. On February 18, 2022, the Board recommended compiling a list of approved emerging invasive invertebrate pests that meet this definition. On August 5, 2022, the Board approved the following list of emerging invasive invertebrate pests in accordance with CMR 01-026 Chapter 41: Special Restrictions on Pesticide Use.

POLICY

Any person who seeks a variance from Chapter 41 Section 6 may only do so for the following emerging invasive invertebrate pests as defined in Chapter 41 Section 6 (I):

Asian long-horned beetle (*Anoplophora glabripennis*)
Emerald ash borer (*Agrilus planipennis*)
Hemlock woolly adelgid (*Adelges tsugae*)

This list of species is only to be used in the context of emerging invasive invertebrate pests in outdoor residential landscapes on ornamental vegetation. If an emergency situation exists as outlined in CMR01-26 Chapter 51(VII)(B)(1) for species not on this list, emergency permits must be obtained from the Board prior to use of products with dinotefuran, clothianidin, imidacloprid, or thiamethoxam as active ingredients in residential landscapes.

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United States Environmental Protection Agency

MENU

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EPA Proposes to Stop Authorized Use of Certain PFAS in Pesticide Products

September 1, 2022

Contact Information
EPA Press Office (press@epa.gov)

WASHINGTON – The U.S. Environmental Protection Agency (EPA) is proposing to remove 12 chemicals identified as per- and polyfluoroalkyl substances (PFAS) from the current list of inert ingredients approved for use in pesticide products to better protect human health and the environment.

"Exposure to PFAS is an urgent public health and environmental issue in our country and we're continuing to work aggressively to reduce the use of these dangerous chemicals," **said Michal Freedhoff, Assistant Administrator for the Office of Chemical Safety and Pollution Prevention.** "Ensuring that these 12 chemicals can no longer be used in pesticides is an important step to protect workers, the public, and our planet from unnecessary PFAS exposure."

Under the PFAS Strategic Roadmap <https://epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024>, EPA committed to taking a renewed look at previous PFAS decisions, and, as part of this review, undertook a thorough review of its list of chemical substances that

have been approved for use as inert ingredients in pesticide products. EPA then used its authority to take quick action on PFAS inert ingredients not currently used in registered pesticide products.

Pesticide products contain at least one active ingredient and other intentionally added inert ingredients. Inert ingredients play key roles in pesticide effectiveness and product performance including extending the product's shelf life or improving the ease of application by preventing caking or foaming. EPA reviews safety information for inert ingredients before they can be included in a pesticide.

While these PFAS are no longer used in any registered pesticide products, EPA determined it is important to remove these 12 chemicals from the list of approved inert ingredients to allow for an updated review of available information for these chemicals to be required, if their future use in pesticide products is requested:

- 2-Chloro-1,1,1,2-tetrafluoroethane (CAS Reg. No. 2837-89-0);
- α-(Cyclohexylmethyl)-ω-hydropoly(difluoromethylene) (CAS Reg. No. 65530-85-0);
- Dichlorotetrafluoroethane (CAS Reg. No. 1320-37-2);
- Ethane, 1,1,1,2,2-pentafluoro- (CAS Reg. No. 354-33-6);
- Hexafluoropropene, polymer with tetrafluoroethylene (CAS Reg. No. 25067-11-2);
- Montmorillonite-type clay treated with polytetrafluoroethylene (No CAS Reg. No.);
- Poly(difluoromethylene), α-chloro-ω-(1-chloro-1-fluoroethyl) (CAS Reg. No. 131324-06-6);
- Poly(difluoromethylene), α-chloro-ω-(2,2-dichloro-1,1,2-trifluoroethyl)- (CAS Reg. No. 79070-11-4);
- Poly(difluoromethylene), α-(2,2-dichloro-2-fluoroethyl)-, ω-hydro- (CAS No. 163440-89-9);
- Poly(difluoromethylene), α-fluoro-ω-[2-[(2-methyl-1-oxo-2- propenyl)oxy]ethyl]- (CAS Reg. No. 65530-66-7);
- Poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, ether with α-fluoro-ω-(2-hydroxyethyl)poly(difluoromethylene) (1:1) (CAS Reg. No. 65545-80-4); and
- Propane, 1,1,1,2,3,3,3-heptafluoro- (CAS Reg. No. 431-89-0).

Upon publication of the Federal Register notice, EPA will accept public comments on this proposal for 30 days in docket EPA-HQ-OPP-2022-0542 at www.regulations.gov <http://www.regulations.gov/>. If removed from the list, any proposed future use of these

chemicals as inert ingredients will need to be supported by data which may include studies to evaluate potential carcinogenicity, adverse reproductive effects, developmental toxicity, genotoxicity as well as data on environmental effects.

Pesticide registration decisions are based on extensive data requirements as outlined in 40 CFR 158 which applies to both active ingredients and the inert materials contained in end use products. EPA continues to evaluate all pesticide active ingredients to determine if any meet the current structural definition of PFAS or are part of other related chemistries that have been identified by stakeholders as being of concern. EPA will continue to provide updates as more information becomes available.

To read a prepublication version of this proposal and for more information on inert ingredients approved for use in pesticide products visit the Inert Ingredients Overview and Guidance page <https://epa.gov/pesticide-registration/inert-ingredients-overview-and-guidance>.

Contact Us <https://epa.gov/newsreleases/forms/contact-us> to ask a question, provide feedback, or report a problem.

LAST UPDATED ON SEPTEMBER 20, 2022

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No FEAR Act Data <https://epa.gov/ocr/whistleblower-protections-epa-and-how-they-relate-non-

Journal of Hazardous Materials Letters 3 (2022) 100067

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Targeted analysis and Total Oxidizable Precursor assay of several insecticides for PFAS

Steven Lasee [a,*,1], Kaylin McDermett [a], Naveen Kumar [a], Jennifer Guelfo [a], Paxton Payton [b], Zhao Yang [a], Todd A. Anderson [a]

[a] Texas Tech University, 2500 Broadway, Lubbock, TX 79409, the United States of America
[b] Cropping Systems Research Laboratory, US Department of Agriculture, 3810 4th Street, Lubbock, TX 79401, the United States of America

ARTICLE INFO

Keywords:
PFAS
PFOS
Insecticides
Exposure
Agriculture

ABSTRACT

Targeted analysis for 24 Per- and Polyfluoroalkyl Substances (PFAS) was conducted on 10 insecticide formulations used on a United States Department of Agriculture crop research field. Perfluorooctane sulfonic acid (PFOS) was found in 6 of the 10 formulations with concentrations ranging from 3.92 to 19.2 mg/kg. Further analysis of soil and plant samples collected at the site found several additional PFAS, with PFOS being the most prominent. Suspect screening was then conducted on the formulations and provided several suspected PFAS in addition to the 24 targeted analyzed PFAS in 7 of the 10 samples, one of which showed no PFAS during targeted analysis. PFAS-precursor oxidation was then conducted on the two insecticide formulations with the greatest lists of suspected PFAS as validation of potential unknown PFAS in the formulations. This study revealed a previously unknown potential PFAS contamination source for rural and agricultural environments.

1. Introduction

The chemical class per- and poly-fluoroalkyl substances (PFAS) have drawn regulatory focus due to their potential toxicity (Bach et al., 2016; Barry et al., 2013; Gallo et al., 2012; Halldorsson et al., 2012; Jantzen et al., 2016; Johansson et al., 2009; Melzer et al., 2010; Midgett et al., 2015; Savitz et al., 2012; Steenland et al., 2013; Wielsøe et al., 2015), tendency to trophic transport (Awad et al., 2011; Giesy and Kannan, 2001; Hagenaars et al., 2008; Kwadijk et al., 2010; Vestergren et al., 2013), and their environmental mobility and persistence (United States Environmental Protection Agency, 2019). Within the PFAS chemical group, perfluoroalkyl acids (PFAAs) have been the primary focus of research and legislation due to a strong display of the previously mentioned traits and relatively high environmental occurrence.

In February 2019, the United States' Environmental Protection Agency (EPA) published an action plan concerning PFAS exposure and contamination in the United States (United States Environmental Protection Agency, 2019). One of the research areas identified by the action plan as needing additional input was "What are the sources, fate and transport pathways, and exposures to humans and ecosystems?" (United States Environmental Protection Agency, 2019). The most common characterized sources of environmental PFAS contamination are associated with wastewater and biosolids, aqueous firefighting foam (AFFF), and products containing PFAS and PFAS precursor manufacturing and use (Key et al., 1997; Prevedouros et al., 2006). This list is not comprehensive, especially for agricultural or rural communities. To promote advancement in this area, the United States' EPA allocated $5 million on August 20th, 2020 for new research on managing PFAS in agricultural and rural communities.

In a trial run of a prior study on plant uptake of PFAS (Lasee et al., 2019, 2020), it was discovered that there was detectable PFAS contamination in control plant samples grown in a United States Department of Agriculture (USDA) cropping systems research laboratory greenhouse. Targeted Liquid Chromatography-Mass Spectrometry (LC-MS/MS) analysis was performed to find the source of the PFAS contamination; identified PFAS in the soil on site, other research plants grown on site, and various insecticides used on the site, while site water, potting soil, and fertilizers were all non-detect for PFAS. The objective of this study was to characterize the PFAS found in the tested insecticide formulations and to attempt to connect that PFAS to PFAS found in the soil. Suspect screening was conducted on the insecticide products in an effort to identify possible "unknown" PFAS in the products. Then we

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conducted the Total Oxidizable Precursor assay to quantify how much "unknown" PFAS were observed in two of the insecticide samples.

2. Materials and methods

2.1. Materials

All calibration (4:2 FTS, 6:2 FTS, 8:2 FTS, N-MEFOSAA, N-EtFOSAA, PFBA, PFPeA, PFBS, PFHxA, PFPeS, PFHpA, PFHxS, PFOA, PFOS, PFHpS, PFNA, PFOSA, PFDA, PFNS, PFUdA, PFDS, PFDoA, PFTrDA, and PFTeDA) and stable isotope (^{13}C4-PFBA, ^{13}C5-PFPeA, ^{13}C3-PFBS, ^{13}C5-PFHxA, ^{13}C2–4:2FTS, ^{13}C4-PFHpA, ^{13}C3-PFHxS, ^{13}C8-PFOA, ^{13}C2–6:2FTS, ^{13}C9-PFNA, ^{13}C8-PFOSA, ^{13}C8-PFOS, ^{13}C6-PFDA, ^{13}C2–8:2FTS, ^{13}C7-PFUdA, d3-MeFOSAA, d5-EtFOSAA, ^{13}C2-PFDoA, ^{13}C2-PFTeDA) standards were obtained from Wellington Laboratories (Guelph, Ontario). The 24 PFAS selected were those included in the EPA SW-846 Test Method 8327. Tested insecticides formulations were collected from the test site (a USDA crop research laboratory).

It is important to note that we have observed some 50- and 15-mL test tubes and analysis grade solvents have shown trace PFAS residuals that can lead to contamination of a sample. We recommend the careful use of solvent blanks and prior analysis of materials and products to remove the risk of sample contamination from these sources. LC-MS/MS-grade methanol, water, and acetonitrile used in this study were purchased from Honeywell (Charlotte, North Carolina). 50- and 15-mL test tubes used in this study were VWR® High-Performance Conical-Bottom Centrifuge Tubes with Flat Cap, Polypropylene (Radnor, Pennsylvania). Prior analysis of these solvents and test tubes did not show concentrations of the 24 PFAS targeted in this study. Scoopulas used in this study were disposable polypropylene scoopulas from VWR® (Radnor, Pennsylvania).

2.2. Insecticide collection and analysis

Ten different insecticide formulations were collected from the crop research site after the analysis of soil from the site found concentrations of a variety of PFAS species. The selected insecticides were only those recorded as used on the site in 2017. In 2020, the insecticides were confirmed to still be in use at the site. Insecticide formulates sampled were collected from a cabinet designated for storage of all pesticides in use on site. All pesticides stored in the cabinet were kept, if possible, in their original resealable packaging. If the original packaging did not allow for sealing or the seal was damaged, the pesticide, still in its original packaging, was place inside a secondary sealable plastic container. None of this studies sampled insecticides were stored in secondary containers.

Formulations samples were collected with disposable scoopulas and were placed into 15 mL centrifuge tubes for storage. Samples were stored in a hood at 20 °C. Formulations were diluted as 10–100 mg in 10 mL LC-MS/MS-grade methanol and were allowed to dissolve over 24 h in 15 mL centrifuge tubes in triplicates. Formulations were then sonicated in a 20 °C water bath for one hour. Each formulation solution was then diluted to 10 μg formulation/1 mL (10 ppm) with LC-MS/MS-grade methanol in a new 15 mL centrifuge tube. No extraction or filtration steps were used due to concerns that these steps could remove fractions of non-targeted PFAS. To prepare for targeted analysis, 537 μL of formulation/methanol dilution, 3 μL of a 120 ng/mL internal standard (in methanol), and 1260 μL of LC-MS/MS-grade water were added to an auto injector vial (recovery of internal standards presented in S1). To prepare samples for suspect screening, 540 μL of each 10 μg/1 mL formulation/methanol dilution and 1260 μL of LC-MS/MS-grade water were added to an auto injector vial. Samples were stored at 5 °C until analysis. For both targeted and non-target analysis, results were calculated between triplicates.

PFAS suspect screening was conducted on all tested insecticides. The list produced by the suspect screening was only partially validated and is therefore incomplete. Accordingly, the current work and discussion is presented in the Supplemental information. Library matches did validate the existence of PFOS in samples. Further identification of suspected PFAS was outside the scope of the current study. Additional information on the suspect screening is presented in the Supplemental information, with the results of the suspect screening presented in Table S2.

2.3. Total Oxidizable Precursor assay

The Total Oxidizable Precursor (TOP) assay developed by Houtz and Sedlak (2012) was used to convert suspected PFAS to PFAAs for which standards were available (ie. PFBA, PFBS, PFPeA, PFPeS, PFHxA, PFHxS, PFHpA, PFOA, PFOS, PFNA, etc.). Insecticide 6 was chosen for this technique because suspect screening (Table S2) showed that insecticide 6 was the only insecticide with a targeted analysis hit (PFOS in insecticides 1–6) with a suspected PFAS with an area of the same order of magnitude as its known PFAS (109,500 vs. 324,100). All other PFAS with a targeted analysis hit did not have suspected PFAS with an area of the magnitude as their known PFAS indicating that they may not have a large "unknown" PFAS fraction. Additionally, insecticide 6′s is one of the most commonly used organophosphate. Insecticide 10 was selected for TOP analysis due to being the only tested insecticide that did not show PFAS concentrations during targeted analysis, but showed activity during suspect screening (Table S2). Many of insecticide 10′s suspected PFAS had large areas indicating that TOP analysis may reveal a large "unknown" PFAS fraction.

2.4. Soil and vegetation sample collection and preparation

The study site was a USDA crop research laboratory that uses the 5 fields on site to said crops. Soil and vegetation samples were collected from these fields. Soil and vegetation sample were collected by a nitrile gloved hand and placed in 50-mL test tubes. Prior to ownership by the USDA, the site was owned by Texas Tech University and was kept as native rangeland. Wastewater, biosolids, or municipal sludge (known PFAS contamination sources) have not been applied to the site. Nearby fields (within 2 miles) also had PFAS concentrations in the soil. Accordingly, none of them were used as controls. This is not surprising as most agricultural fields in the area grew cotton and likely used the same or similar pesticides.

At the time of sampling, Fields 1 and 4 were planted with cotton, Fields 2 and 3 were planted with sorghum, and Field 5 as planted with corn, cotton, sorghum, peanuts, and beans. Approximate sampling locations are presented in Fig. 1. Soil samples were collected as a composite of 5–6 surface grab samples taken from a single field. It rained 0.4 in. the morning before samples were collected. Corn, bean, and peanut grab samples were collected from Field 5; corn samples were collected as kernels only from immature cobs, bean samples were collected as both seed and pod, and peanut samples were collected as seed and pod from the soil. Each sample was washed in DI water to remove clinging soil. Samples were then dried at 70 °C for 24 h. Dried soil and plant samples were then homogenized. Approximately 2 g of dried soil and 0.5 g of dried vegetation sample were placed in 50-mL polypropylene centrifuge tubes and stored at room temp (20 °C) to await extraction.

2.5. Soil and vegetation extraction

Soil and vegetation samples were extracted as published in Zhao et al. (2013) with the exception of filtering the final extract with a nylon filter. Prior work conducted in the laboratory showed that nylon filters may remove significant fractions of some longer chained PFAS and PFAS precursors. Extractions were reconstituted in 30 % methanol/ 70 % water and stored in 2-mL auto-sampler vials at 5 °C until analysis. Average recoveries for the 19 internal standards (IS) are presented in Table S3 for plant tissue samples. Recoveries using this technique were

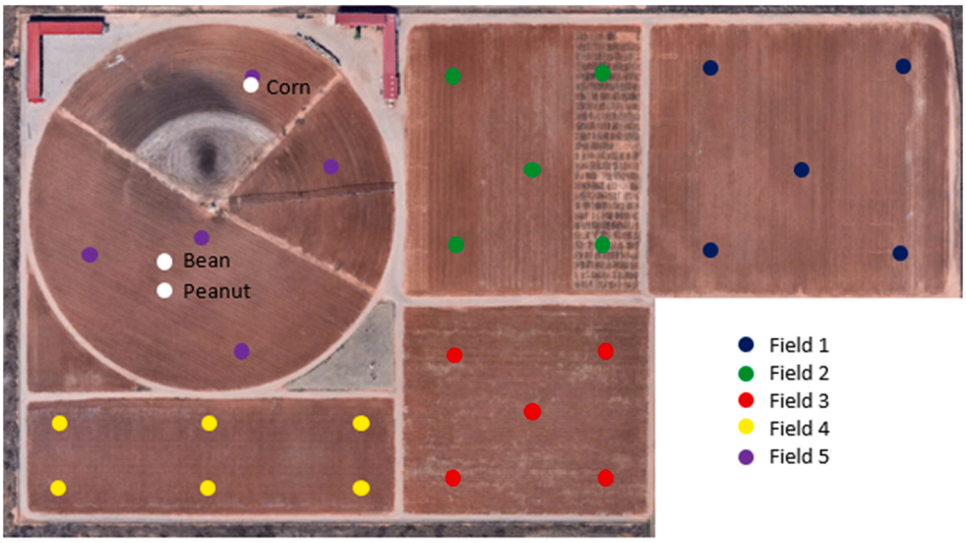

Fig. 1. Soil and plant sampling locations on the study site. All soil samples taken from the same field were combined as a composite sample for analysis.

low for several PFAS IS in soil samples, so soil samples were extracted again using a basic methanol extraction technique modified from Higgins et al. (2005) (IS recoveries presented in Table S4).

2.6. Quality assurance

All samples (insecticide formulations, soil, and plant tissue extractions) were injected in triplicate. Every 9 injections (3 samples) alternating 10 ng/L and 500 ng/L standards were injected for quality control. Extraction blanks were utilized for the plant tissue and soil extractions, and a solvent blank was used for the insecticide formulations as no extraction was done with these samples. Significant 6:2 FTS contamination was observed in the plant and soil extraction samples and as a result, 6:2 FTS concentrations in these samples were not reported due to concerns in their authenticity. SW-846 Test Method 8327 was used for acceptable recovery range (70–130 %). Limits of quantification (LOQs) were determined by injection of 1, 2, 5, and 10 ng/L standards and are presented in the Supplemental information.

2.7. Instrument conditions

Chromatographic separation was carried out using a SCIEX ExionLC™ equipped with a Phenomenex Gemini® C18 column (100 × 3 mm; 3 μm particle size) with a Phenomenex SecurityGuard™ Gemini® C18 (4 × 2 mm) guard column. The column oven temperature was set to 40 °C. The following conditions were used: elution solvents were 20 mM ammonium acetate in water (A), methanol (B) mobile phase composition (A:B; v/v) was 95:5 at 0 min, increasing to 35:65 at 1.6 min, increasing 0:100 at 8 min, and switching to 5:95 at 12.8 min which is maintained until 16 min. The flow rate was 700 μL/min and the injection volume was 500 μL. The LC was coupled to a X500R Quadrupole Time-of-Flight mass spectrometer (SCIEX). These settings were used for both the targeted analysis and suspect screening. Suspect screening was conducted using Electrospray Ionization in negative mode.

3. Results

3.1. Targeted analysis of formulations

The results of PFAS targeted analysis of the insecticide formulations are presented in Table 1. PFAS concentrations were above the LOQ for only one of the 24 species (PFOS) in the 10 analyzed formulations. PFOS

Table 1
Average concentration of PFOS in the analyzed insecticide formulations (mg PFAS/kg formulation or ppm, ± standard deviation). The concentrations reported were calculated from the dilution described previously in the "Insecticide Analysis section". PFAS with no concentrations above LOQ were not included in this table.

Sample ID	Formulation type	Active ingredient	PFOS (mg/kg)
1	Liquid concentrate	Abamectin	3.92 ± 0.51
2	Emulsified suspension	Novaluron	9.18 ± 0.34
3	Liquid concentrate	Mineral Oil (Petroleum oil)	8.64 ± 0.67
4	Emulsified suspension	Imidacloprid	13.3 ± 1.4
5	Emulsified suspension	Spiromesifen	19.2 ± 1.2
6	Liquid concentrate	Malathion	17.8 ± 0.7
7	Wettable powder	*Beauveria Bassiana*	0
8	Wettable powder	Pyridalyl	0
9	Emulsified suspension	Spinosad	0
10	Wettable powder	Spinetoram, Sulfoxaflor	0
BLANK			0

was found in 6 of 10 formulations (3.92–19.17 mg/kg). Peaks for a variety of other PFAS were observed in the samples, primarily PFHxS and PFBS, although none of these peaks surpassed the instrument LOQ (1–10 pg/g in dilutions). This is not surprising as PFAS tend to exist as complex mixtures. Additionally, if the source of the PFOS found in the samples were PFAS precursors, PFAS precursors often degrade into several different PFAAs (Gebbink et al., 2015; Mejia Avendaño and Liu, 2015; Vestergren et al., 2008). The sample injection was a 1:100,000 dilution in methanol, therefore the < LOQ concentrations of PFHxS and PFBS could be detectable in a lower dilution and may still accumulate in soils overtime.

While the PFAS concentrations found in this study are a cause for concern, these insecticides are a highly concentrated product. The dilution and application directions for most of the collected insecticide formulations were approximately 4–8 fluid ounces diluted in 100 gallons of water. At 8 fluid ounces, that is a 1600-fold dilution by volume.

3.2. Targeted analysis of soils

Results of the targeted analysis of surface soil of the 5 tested fields are presented in Table 2. PFOS was the PFAS species with the highest

Table 2
Average soil concentrations (ng PFAS/kg dry soil, ± standard deviation) of PFAS from the targeted analysis of soil samples from five fields. All samples were aggregates of 5–6 surface soil grab samples that were homogenized. Standard deviations are presented in parentheses.

	Field sampled					
PFAS	1	2	3	4	5	BLANK
4:2 FTS	51 ± 7.0	36 ± 7.3	32 ± 5.3	23 ± 3.5	30 ± 5.0	< LOQ
PFOA	42 ± 9.2	72 ± 12	173 ± 38	46 ± 5.1	47 ± 6.5	< LOQ
PFNA	18 ± 2.5	33 ± 6.7	43 ± 7.5	12 ± 1.8	14 ± 1.5	< LOQ
PFOS	698 ± 120	1150 ± 165	1720 ± 299	156 ± 26	247 ± 14	0.0
8:2 FTS	31 ± 7.5	23 ± 4.6	19 ± 2.6	12 ± 0.8	11 ± 2.9	0.0
PFUdA	52 ± 13	58 ± 14	69 ± 8.8	30 ± 1.8	40 ± 8.9	0.0

concentration found in the soil followed by PFOA and 4:2 FTS, 8:2 FTS, PFNA, PFOA, and PFUdA (which all had similar concentrations). Many of the other 24 PFAS species in the targeted analysis were below the LOQ. The full results are reported in Table S5. The targeted analysis placed Field 3 as the field with the highest PFAS concentrations followed by Field 2, Field 1, Field 5, and Field 4. The goal of this sampling technique was to create a single sample that could be a qualitative representative of both known (targeted analysis) and unknown (non-target analysis) PFAS in a field. Additionally, PFAS are known to distribute heterogeneously in soils (Rankin et al., 2016). The soil sampling was only of the surface; different PFAS are known to have a variety of soil distribution patterns (Guelfo and Higgins, 2013). Given those three points, we would not consider concentrations presented in Table 2 to be accurate representatives of a quantitative distribution of PFAS in the tested fields.

The water used to irrigate the research center was also analyzed by mixing 1.4 mL of water with 0.6 mL methanol and directly injecting it. No quantifiable concentrations of target PFAS were found in the water, although, solid phase extraction of a greater volume of water could produce quantifiable concentrations of PFAS.

3.3. Targeted analysis of plant tissues

The results of PFAS targeted analysis of corn kernel, string bean, and peanut are presented in Table 3. In the analyzed insecticides, PFOS was the primary component observed, followed by PFHxS and PFBS (both were below the LOQ). The corn and bean samples, which were collected from the above ground portions of the plants, had PFAS concentrations an order of magnitude higher for PFBA, PFHxA, PFHxS, and PFOS than the peanut sample, which was collected as a below ground portion. For PFHpA, the concentration in the peanuts was an order of magnitude higher than those in the corn and bean tissues. These plant tissues were collected as single, opportunistic grab samples. Replicate sampling

Table 3
Average tissue concentrations (ng PFAS/kg dry plant tissue or ppt) of PFAS from the targeted analysis of corn kernel, string bean pod, and peanuts. All samples are were collected from the commonly consumed tissue of these plants. Standard deviations are presented in parentheses.

	PFBA	PFHpA	PFHxA	PFHxS	PFOA	PFOS
CORN	1120 ± 143	38 ± 2.2	1020 ± 130	4900 ± 147	349 ± 138	3230 ± 316
BEAN	3300 ± 48	37 ± 0.8	138 ± 76	1150 ± 104	176 ± 72	4260 ± 154
PEANUT	580 ± 31	313 ± 39	0	200 ± 59	162 ± 35	407 ± 13
BLANK	0	0	0	0	0	0

throughout the field was not done. Thus, concentrations found in these samples should not be considered representative of the harvested crop.

3.4. Total Oxidizable Precursor assay

The TOP assay was done on insecticides 6 (active ingredient Malathion) and 10 (active ingredients Spinetoram and Sulfoxaflor). The results comparing the before assay to after assay concentrations are found in Fig. 2. The TOP assay technique converts PFAA precursors to PFAAs, although it is not a perfect or complete process. Both insecticides saw an increase in moles of PFAS after the TOP assay was conducted. Suggesting that both insecticides had significant "unknown" PFAS concentrations. Insecticide 6's total PFAS moles nearly tripled (pre – 0.24 μmoles/L vs. post – 0.64 μmoles/L) and insecticide 10 was revealed to have nearly as much PFAS in it as insecticide 6 (0.61 μmoles/L vs. 0.64 μmoles/L) despite not showing any PFAS concentrations in targeted analysis.

4. Discussion

4.1. Targeted analysis

All insecticides tested in this study are still in production under the same brand names, though the formulations tested should not be assumed to be the same as the ones currently in production, as the sampled product was not new. However, PFAS are known to be incredibly environmentally stable, consequently, historic use of insecticides containing PFAS or PFAS precursors can translate into persistent soil contamination. Soil PFAS have been shown to be absorbed and translocated into plant tissues (Lasee et al., 2019; Bizkarguenaga et al., 2016; Blaine et al., 2014; Lechner and Knapp, 2011; Shobhna et al., 2020; Stahl et al., 2009; Wen et al., 2014). Manufacturing of PFAS began in 1949 (3M, 1999). Historical PFAS containing pesticide use could translate into high concentrations of several different PFAS in agricultural soils that can persist in the soil for many years.

Targeted analysis of PFAS concentrations in the tested insecticides (Table 1) showed PFOS to be the primary PFAS found in the formulations. This was reflected in the aggregate soil samples. Inspection of the chromatographs (Fig. 3, Figs. S1–S10) showed a split peak that is indicative of two isomers (a branched and linear) of PFOS being present. Although similar, the chromatographs are not identical in shape. Soil samples showed a smaller peak for the branched isomer than the formulations. An explanation for this phenomenon could be that the soil samples collected were of surface soil and branched PFOS isomers have shown greater environmental mobility than linear PFAS (Chen et al., 2015), leading to a disproportionately greater decrease of branched PFOS surface soil concentrations over time compared to its linear counterpart. In addition, these soil samples are environmental, so multiple PFAS input sources are likely. It is not uncommon to find a variety

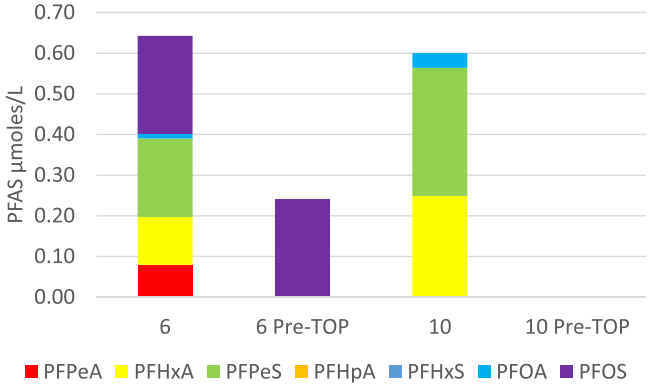

Fig. 2. Average pre- vs. post-TOP PFAS concentrations (μmoles/L) in insecticides 1 and 6.

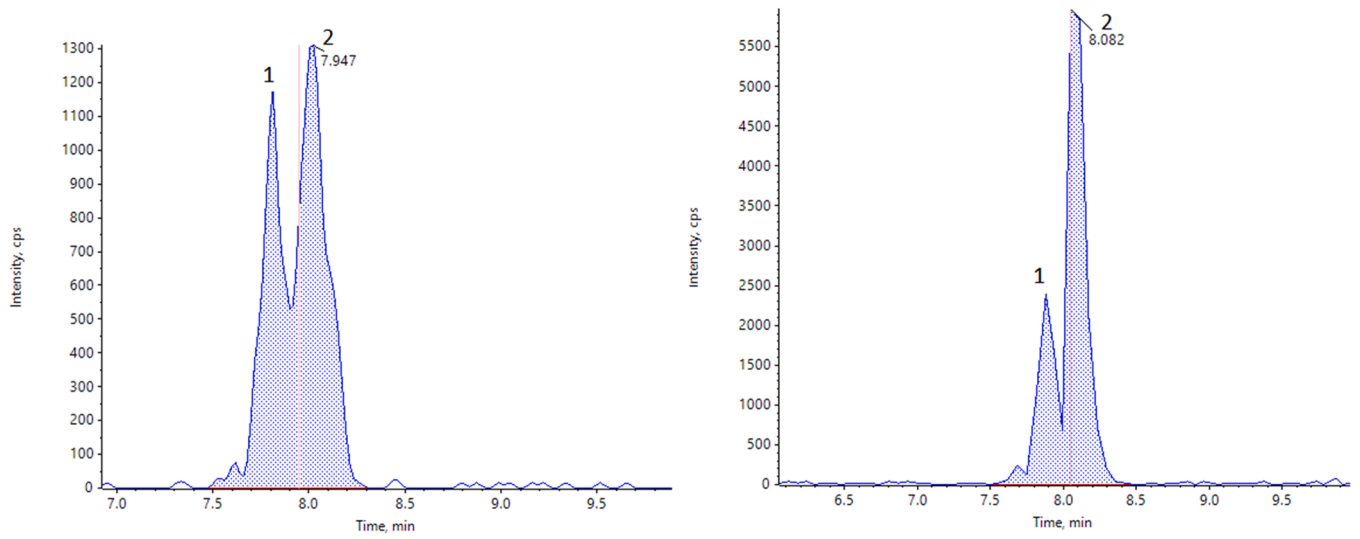

Fig. 3. Chromatographs of PFOS in insecticide 5 (right) and field 3 (left). The branched isomer of PFOS is labeled with 1 and the linear isomer of PFOS is labeled with 2.

of different PFAS in any soil grab sample. PFAS are solely made anthropogenically and many have been known to undergo long-range transport in the environment. Rankin et al. (2016) found dry weight concentrations ranging between 29 and 14,300 ng/kg for total perfluoroalkyl carboxylates and < LOQ-3270 ng/kg for total perfluoroalkyl sulfonates from surface soil samples collected from all continents, including areas judged to have no evident human impact.

Electrochemical fluorination (ECF) and telomerization are the two primary processes used in the production of PFAS and PFAS-related products. Production of PFAS by ECF was mostly phased out in the US in 2002. The existence of branched isomers of PFAS and homologs (like PFHxS for PFOS) are indicative of the ECF production process for PFAS (Benskin et al., 2010). The PFOS chromatograms of the sampled soil and insecticides (that contained PFOS) showed branched isomer peaks (Figs. S1–12). Another hallmark of PFOS produced by ECF is the significant presence of PFHxS also being found in the sample. In the present study's plant tissue grab samples, significant PFHxS concentrations were observed alongside significant PFOS concentrations.

4.2. Plant samples

Blaine et al. (2013) found that negligible amounts of soil PFAS were taken up and deposited in corn grains from corn plants grown in PFAS contaminated biosolid-amended soils. Scher et al. (2018) found negligible concentration of PFBA (the PFAS they found to have the highest bioconcentration potential) in corn kernels and low PFAS concentration in bean pods watered with PFAS-contaminated water. These two studies would suggest that if the corn and bean plants were collected were grown in PFAS-contaminated soil and water, little to no PFAS, other than small amounts of PFBA, would be found in their seeds. The PFAS concentrations found in the tested corn grain and bean pod samples (Table 3) would suggest that the source of these PFAS was not the soil or water they were grown in. Targeted analysis of the tested insecticide samples (Table 1) could account for the PFOS concentrations observed in the corn and bean samples, but not for the other 5 PFAS we observed (PFBA, PFHxA, PFHxS, PFHpA, and PFOA).

The tested formulations in Table 1 are only those found in the complete record of the pesticides applied to the fields in 2017. The tested insecticides likely do not encompass all the potential PFAS sources that could be applied to the site historically. The site is located near third party fields that could contribute pesticide and other product drift. Additionally, the site is located in a city that experiences dust storms several times a year. PFAS have been observed in a variety of dusts (Murakami and Takada, 2008; Wang et al., 2010; Fromme et al., 2009), and dust storms could result in environmental transport of top soil PFAS in dry environments.

The soil samples collected were surface samples. Surface level PFAS distribution often does not match distribution at lower levels (Sepulvado et al., 2011). The roots of the three plants species likely have access to soils whose PFAS concentrations and distribution may not match that of the surface samples collected for this study. This could explain why the peanut samples had concentrations of PFBA, PFHxS, and PFHpA, while none of the sampled surface soil had significant concentrations of those analytes.

4.3. Significance of PFAS in pesticides

Major PFAS contamination has mostly been associated with industrial production and use of PFAS, sites with the use of aqueous firefighting foams, and municipal and industrial waste. While the insecticides tested are commonly used on cotton, a non-consumptive agricultural product, PFAS are generally believed to not significantly degrade environmentally. Years of continuous use of PFAS and PFAS precursor-containing pesticides could lead to significant concentration of PFAS in the soil. Future use of soils treated with PFAS contaminated pesticides for other crops or pesticide drift could lead to PFAS concentrations being found in crops used for human or animal consumption. This potential was observed in three samples of foodstuff crops (corn, beans, and peanuts) that were grown on site, although the source of the PFAS in these crop samples does not appear to be the soil.

One PFAS, N-ethyl perfluorooctane sulfonamide or Sulfluramid (EtFOSA; $C_8F_{17}SO_2NHC_2H_5$), has been used in ant and roach insecticides. EtFOSA is known to degrade into PFOS and FOSA and contribute to environmental concentrations of these chemicals (Nascimento et al., 2018). EtFOSA was not detected in targeted analysis or suspect screening of this study's 10 test insecticides. Applied EtFOSA containing insecticides are currently known to be used in South America to deal with leaf cutter ant, an issue unlikely to occur at the test site.

Insecticide 6′s active ingredient is malathion. Malathion was, at one point, the most commonly used organophosphate insecticide in North America (Bonner et al., 2007). Only one specific formulation was tested. If many malathion formulations, for all of their many uses, contained PFOS concentrations similar to those found in insecticide formulation 6, many people around the world could be expose to PFOS through malathion use.

Suspect screening of all 10 insecticides and TOP assay on insecticides

6 and 10 showed potential for PFAS concentrations outside of the 24 targeted PFAS. Insecticide 10 showed no PFAS concentrations when run for target PFAS analysis, but both suspect screening and the TOP assay showed potential PFAS in the insecticide.

5. Conclusions

In the present work we have discovered PFOS in 6 out of 10 tested insecticides commonly used to treat cotton. In doing so, we identified a source of PFAS environmental contamination for rural and agricultural areas that potentially has been, and could continue to, impact PFAS concentrations in human and animal foodstuff crops grown in these areas. Suspect screening and PFAA-precursor oxidation tests showed evidence PFAS outside of the 24 PFAS included in the targeted analysis in 7 of 10 of the insecticides we tested. Our research also detected multiple PFAS species in soil and plant grab samples beyond what was observed in the insecticides we tested (PFOS). Results from our suspect screening and PFAA-precursor oxidation tests could offer a possible explanation for these concentrations. In this study, we only characterized PFAS concentrations in 10 different insecticides. Further investigation of a wider variety of pesticides as potential PFAS contamination sources should be done to better understand the PFAS exposure risk pesticides could present.

Environmental Implications

(a) The studied material concerns the chemical group per- and polyfluorinated substances (PFAS) which are of utmost regulatory concern around the world.
(b) The work describes a previously unknown source, pesticides, for environmental PFAS contamination.

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Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The corresponding author (Steven Lasee) currently is a research fellow for the Oak Ridge Institute for Science and Education that works with the United States Environmental Protection Agency. The Author also runs the consulting firm “Lasee Research and Consulting”.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.hazl.2022.100067.

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Maine Department of Environmental Protection

PFAS in Products

In July 2021, Public Law c. 477, An Act To Stop Perfluoroalkyl and Polyfluoroalkyl Substances Pollution (http://www.mainelegislature.org/legis/bills/getPDF.asp?paper=HP1113&item=5&snum=130) (LD 1503, 130th Legislature) was enacted by the Maine Legislature. This new law requires manufacturers of products with intentionally added PFAS to report the intentionally added presence of PFAS in those products to the Department beginning January 1, 2023. The law also prohibits the sale of carpets or rugs, as well as the sale of fabric treatments that contain intentionally added PFAS beginning on January 1, 2023. Effective January 1, 2030, any product containing intentionally added PFAS may not be sold in Maine unless the use of PFAS in the product is specifically designated as a currently unavoidable use by the Department.

To implement the product notification requirements the Department is working with the Interstate Chemicals Clearinghouse to develop an online reporting database similar to those already in use by other states. The Department is also in the process of developing a rule to clarify the upcoming reporting requirements. During rule development process there will be an opportunity for stakeholder input on the implementation of the prog If you are interested, please sign up to receive notification of Department rulemaking and opportunity to comment notices (https://www.maine.gov/dep/how-do-i/how-do-i.html?id=381237) on our website.

Find more information on PFAS in Maine (../index.html)

The FAQs below are meant to address common questions regarding Maine's law addressing products conta intentionally added PFAS, 38 M.R.S. §1614 (https://legislature.maine.gov/statutes/38/title38sec1614.html). Please note, the answers below are subject to change in response to feedback and changes in regulation.

For more information, contact Kerri Malinowski Farris (mailto:kerri.malinowski@maine.gov) at 207-215-1894

Frequently Asked Questions

Click on the topics below to expand each section.

Show/Hide all FAQ answers (#)

What products containing intentionally added PFAS will be prohibited from being sold in Maine?

Beginning January 1, 2023 fabric treatments and carpets or rugs containing intentionally added PFAS prohibited from being sold to consumers in the State of Maine.

Beginning January 1, 2030 all other products containing intentionally added PFAS will be prohibited fro sale to consumers in the State of Maine, unless the Department has exempted certain products after determining that the use of PFAS in those products is a currently unavoidable use (as determined by Department rule).

The Department may prohibit sale of products containing intentionally added PFAS prior to 2030 only b major substantive rulemaking.

The Department may determine by rule that a product containing intentionally added PFAS or a use of is an unavoidable use and allow sales of such products to continue despite otherwise being prohibited. M.R.S. §1614(5)(C&D))

What chemicals are considered PFAS under this program and require notification to the Department?

Under the statute PFAS are broadly defined as “substances that include any member of the class of flu organic chemicals containing at least one fully fluorinated carbon atom.” Any intentionally added chemi meeting this definition will trigger the notification requirement. Individual PFAS must be identified by Chemical Abstract Service number.

Will the Department publish a list of chemicals that meet the definition of PFAS?

The statute requires any chemical containing at least one fully fluorinated carbon atom that is intention added to a product be reported to the Department regardless of whether it is found on any list.

The U.S. EPA maintains a webpage of chemicals considered PFAS (https://comptox.epa.gov/dashboard/chemical-lists/pfasmaster) which provides some clarity on what compounds are considered within the definition of PFAS.

The Department is working with the database developer to add a drop-down list of known CAS numbe PFAS, and a text entry field for any PFAS CAS or name not in the prepopulated drop-down list.

Are products that are sold for industrial or commercial use treated differently than those meant for personal c residential use?

No, under the law all products, regardless of whether they are sold for personal, residential, commercia industrial use are treated the same.

The law also requires reporting for components of the final product and products that are sold to be incorporated into another product. (38 M.R.S. §1614(1)(G))

When must manufacturers notify the Department of products that contain intentionally added PFAS?

All products containing intentionally added PFAS which are sold in Maine must be registered beginning January 1, 2023, prior to sale or distribution in the State, or amended when there is a substantial chang M.R.S. §1614(2)) Substantial change will be clarified as part of the rulemaking process.

This is a one-time report submitted to the Department for each product captured by the rule.

How will the DEP implement the notification requirements found in 38 M.R.S. §1614(2)?

The Department is currently working with the Interstate Chemical Clearinghouse (IC2) to develop an or notification system which will be used for all products containing intentionally added PFAS which are so Maine.

Because development is currently underway, we are not able to provide a specific date when the notifi system will be available to the regulated community. Please check the program webpage for updates c development process. However, the Department anticipates plans for the tool to be available in advanc statutory notification date of January 1, 2023.

What information will be required as part of the submission to the Department?

Beginning Jan 1, 2023, the Department must be notified of any product containing intentionally added I that is sold in Maine 38 M.R.S. §1614(2) Those reports require, at a minimum, the following:

- A brief description of the product;
- The purpose for which PFAS are used in the product, including in any product components;
- The amount of each of the PFAS, identified by its chemical abstracts service registry number, in t product, reported as an exact quantity determined using commercially available analytical metho as falling within a range approved for reporting purposes by the department;
- The name and address of the manufacturer, and the name, address and phone number of a cont person for the manufacturer; and
- Any additional information established by the department by rule as necessary to implement the requirements of this section.

These requirements will be further clarified as part of the rulemaking.

Are there circumstances where the Department would require less information be provided as part of the notification?

The Department may waive certain notification requirements if it finds that the information to be waived already publicly available. (38 M.R.S. §1614(3))

My product has already been registered with another state as having intentionally added PFAS, do I still nee provide notification to the State of Maine?

Unless the Department has entered into an agreement with another State to use a shared notification s all manufacturers must submit notification to the Department of their products containing intentionally a PFAS. To date the Department has not entered into any such agreements. (38 M.R.S. §1614(3))

What is considered a “commercially available analytical method”?

In the context of PFAS, the Department understands “commercially available analytical method” to mea test methodology used by a laboratory that performs analyses or tests for third parties in order to deter the concentration of PFAS present. The Department may accept commercially available analytical met that were performed by an in-house laboratory so long as no alterations were made to the methodolog However, a method that was developed at an in-house laboratory and is not offered by a laboratory pro services to third parties will not be accepted.

Commercially available analytical methods include methods approved by the U.S. Environmental Protectio Agency (EPA) (https://www.epa.gov/measurements-modeling/collection-methods) when used in accordance with that approval.

Will the Department provide a list of “commercially available analytical method(s)”?

As commercially available analytic methods can be frequently developed or modified faster than rulema can be undertaken the Department does not intend to provide a list of commercially available analytic methods or laboratories offering those methods in rule.

Will an estimate of PFAS based on production quantity be sufficient?

38 M.R.S. §1614(2)(A)(3) requires that concentrations be “reported as an exact quantity … or as falling within a range approved for reporting purposes by the department”. The manufacturer will need to know a high degree of certainty and confidence what the actual concentration is in any given product.

Will the Department allow for concentration to be reported as being within a range?

The Department intends to collect information from stakeholders to determine which ranges are meani

Can you explain the approval process and what types of products may be allowed to file notification as a “ca or type of product rather than for each individual product.” under 38 M.R.S. §1614(2)(B).

The Department has not yet determined the criteria for such a determination. The notification system fo intentionally added PFAS is intended to serve two purposes. First to allow for easy identification by all parties, including consumers, of which products contain PFAS and if so, how much. The second is to a tracing the sources of environmental contamination with PFAS. As the understanding of how PFAS bel the environment grows the Department may determine there are instances where a single notification f category or type of product by a manufacturer does not conflict with these purposes, in such a case the Department may allow a single notification.

Do you have any other guidance or expect to release guidance for brands in the coming months?

The new statute found at 38 M.R.S. §1614 contains details the reporting entities will find helpful to understanding how this program will be implemented. For those areas requiring clarification, the Depar will be undertaking routine technical rulemaking in the coming months and encourages stakeholder involvement.

The best way to stay up to date on Department rulemaking activity (https://www.maine.gov/dep/rules/index.html) is to sign up to receive notification of rulemaking and public comment opportunities for all Department rulemaking proceedings.

The Department will maintains a webpage for PFAS related materials and guidance (https://www.maine.gov/dep/spills/topics/pfas/)

When will a fee schedule for filing a notification with the Department be available?

The Department is currently gathering the information necessary to set fees for this program, which inc the cost to develop the program and database as well as costs to administer the program. Since this is time registration, the fee may be more than similar programs that require recurring fees.

The Dept will establish fees through routine technical rulemaking. (38 M.R.S. §1614(6)) The best way t informed of Department rulemaking is to sign up for notices as described above.

The Department anticipates that this rulemaking will be completed in advance of the January 1, 2023 notification deadline.

What are the requirements for retailers and store operators for categories of products that have been prohibi being sold in Maine?

A retailer may not sell products containing intentionally added PFAS if the product has been prohibited sale in Maine. Starting January 1, 2023 these include fabric treatments and carpet and rugs.

After January 1, 2030 a retailer may not sell any products containing intentionally added PFAS. With th exception of products the Department has determined, by rule, are exempt from this prohibition becaus use of PFAS is currently unavoidable in that product.

What are the requirements for retailers and store operators for products for which the manufacturer has faile notification with the Department?

It is the manufacturers responsibility to notify the retailer that the product is not eligible for sale in Maine

If a manufacturer has failed to report their product to the Department and have notified the retailer of th failure to report, the retailer may not offer the product containing PFAS for sale in the State of Maine. T Retailer does not need to take any action unless/until they receive notice from the manufacturer of non compliance. (38 M.R.S. §1614(7)(8))

If a product containing PFAS is made outside of the United States who does the Department consider the manufacturer?

Regardless of where the product was produced the company who manufactured or whose names or br appears on the product is considered the manufacturer. In cases where that company does not have a in the United States then either the importer or first domestic distributor of the product will be considere manufacturer. ((38 M.R.S. §1614(1)(E))

If a company customizes an existing product, such as by adding their company logo, who is considered the manufacturer?

So long as the customization of the product does not introduce additional PFAS or products componen containing intentionally added PFAS to the product and the original manufacturer's name or brand rem the product, the original manufacturer will continue to be considered the manufacturer. However, if the underlaying product is not covered by a notification previously submitted to the Department or if the customization process introduces, or adds additional, PFAS or products containing intentionally added then notification must be submitted to the Department.

How are refrigerants used in HVAC applications handled under this program?

The Department is aware that many existing refrigerants either meet or contain a chemical that meets t definition of a PFAS under this program and that future refrigerants may similarly meet the definition.

Currently, under the statute refrigerants would not be subject to a sales prohibition until January 1, 203 Closer to 2030 the Department may undertake an investigation to determine if refrigerants are, at that t currently unavoidable use. Please see the FAQ regarding currently unavoidable uses for more informa

Beginning January 1, 2023 all products, including refrigerants, containing intentionally added PFAS mu reported to the Department via the notification system. Given that refrigerants often have very specific formulations published by organizations such as ASHRAE it may be appropriate for the Department to some or all notification requirements. Please see the "Are there circumstances where the Department v require less information be provided as part of the notification?" FAQ for additional information.

In what time frame must the Department receive notification?

Prior to when the product is first offered for sale in the State of Maine.

Is notification required for products containing intentionally added PFAS that may be classified as a currently unavoidable use?

Yes, as of January 1, 2023 the Department must receive notice of all products that contain intentionally PFAS or its degradation products.

Is notification required if PFAS is used in the manufacturing process, but it is not present in the final product?

No, providing notice to the Department is only required if either PFAS or its degradation products have intentionally added to the product to impart a specific characteristic or function and are present in the p offered for sale.

Do Product Component Manufacturers whose components contain intentionally added PFAS have to submit notice to the Department?

If a Product Component is sold into the State of Maine prior to being incorporated into a Product, which subject to the notification requirement, then the Manufacturer of the Product Component must notify the Department. Product Components that are covered by the notice of the final Product do not need to su notification.

What is the threshold concentration that triggers the notification requirement?

If PFAS is intentionally added to a Product during the manufacturing process and it is detectable when analyzing the Product using a Commercially Available Analytic Method (above the PQL) then a notifica must be submitted to the Department prior to offering the product for sale in Maine beginning January 2023.

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