



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

November 19, 2021

9:00 AM Board Meeting

Video conference hosted in MS Teams, to join the meeting:

Join on your computer or mobile app

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Or call in (audio only)

+1 207-209-4724 United States, Portland

Phone Conference ID: 440 033 928#

AGENDA

1. Introductions of Board and Staff
2. Minutes of the October 8 Regular and August 16 Emergency Board Meetings

Presentation By: Megan Patterson, Director

Action Needed: Amend and/or approve

3. Request to extend a Special Local Need [24(c)] Registration for Arsenal Herbicide with Applicators Concentrate for Increased Surfactant Rate When Used in Combination with Glyphosate for Jack Pine, Red Spruce and White Spruce Release

The Board last approved a Section 24(c) registration for Arsenal Herbicide (EPA Reg. No. 241-299) in 2016 and initially approved it in 2004. This current EPA label specifies a maximum surfactant concentration of 0.25% (v/v) for conifer release. The current and proposed SLN allows the increased rate of surfactants for tank mixes of Arsenal and glyphosate which maximizes the effectiveness of glyphosate.

Presentation By: Mary Tomlinson, Pesticides Registrar and Water Quality Specialist

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Action Needed: Approve/disapprove 24(c) registration request

4. Staff Memo: Update on a Feasible Definition of PFAS in Pesticide Products

At the October 8, 2021 meeting, staff presented a memo discussing the difficulty of identifying a PFAS definition for the implementation of the affidavits required by LD 264. Since that meeting, staff have met with staff at Maine DEP to discuss LD 1503. At that meeting, it became apparent that pesticides would be subject to the requirements of LD 1503 as well as LD 264. Staff will now present the outcome of that research.

Presentation By: Dr. Pam Bryer, Pesticides Toxicologist

Action Needed: Information only

5. Continued Review of Potential Rulemaking Concepts Pertaining to LD 155 (neonicotinoids used in residential turf/landscape management) and Discussion of Next Steps for Proposed Rulemaking in Response to LD 264 (PFAS affidavits and registration of pesticide products) and LD 316 (prohibition on chlorpyrifos distribution)

On June 10, 2021 LD 155, LD 264 and LD 316 were signed into Maine law. At its August 27, 2021 meeting, the Board held stakeholder information gathering sessions addressing these three bills. Following the August meeting, the Board directed staff to return with a review of rulemaking concepts. At the October 8, 2021 meeting of the Board, staff returned with proposed language and further discussion of rulemaking concepts. Following the October meeting, the Board directed staff to return with a draft rule for concepts related to LD 264 and additional information related to outstanding questions on LD 155—primarily related to the definition of “invasive vertebrate species”. Staff will now present their findings.

Presentation By: Megan Patterson, Director

Karla Boyd, Policy & Regulations Specialist

Action Needed: Refine the rulemaking concepts and schedule a hearing

6. Staff Report and Presentation of Sampling Results from the Ten Cities Surface Water Quality Study

On February 26, 2019, the Board approved funding for a staff proposed water quality monitoring effort referred to as the “Ten Cities Project”. The primary objective of the study was to assess the occurrence of pesticides in surface water in urban waters along a population gradient of the ten largest Maine cities. Additional objectives including assessing the feasibility of passive sampling techniques and establishing a baseline for future trend studies of pesticide contamination in the sampled waters. Staff will present the findings of the study.

Presentation By: Dr. Pam Bryer, Toxicologist

Mary Tomlinson, Pesticide Registrar and Water Quality Specialist

Action Needed: Discuss and provide feedback on results

7. 2021 Preliminary Water Quality Monitoring Related to Aerially Applied Herbicides in Forestry

Executive Order 41 FY 20/21 directed the Board to develop a surface water quality monitoring effort to focus on aerial application of herbicides in forestry to be conducted in 2022. In an effort to be responsive to this request and to accommodate what was a changing timeline for completion of the EO request, staff conducted a small preliminary surface water quality monitoring pilot in 2021. Sampling was limited and all samples were collected in advance of planned 2021 aerial applications of herbicides for site preparation and conifer release.

Presentation By: Mary Tomlinson, Pesticide Registrar and Water Quality Specialist

Action Needed: Discuss and provide feedback on results

8. Consideration of a Consent Agreement with Mosquito Squad of Southern Maine, Scarborough, Maine

The Board’s Enforcement Protocol authorizes 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 involves multiple applications by unlicensed/unsupervised individuals, an unauthorized application, failure to notify an individual on the Maine Pesticide Notification Registry, and noncompliant record keeping.

Presentation By: Raymond Connors, Manager of Enforcement

Action Needed: Approve/disapprove the consent agreement negotiated by staff

9. Other Old and New Business

- a. Obsolete Pesticide Collection Results
- b. LD 264 Final Report—January 15, 2022
- c. LD 519 Final Report—February 1, 2022
- d. LD 524 Final Report—January 1, 2022
- e. Executive Order 41 Final Report—Due January 2, 2022
- f. Medical Advisory Committee Update
- g. Other items?

10. Schedule of Future Meetings

At the time of writing, there are no additional meetings scheduled. The Board will decide whether to add dates.

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

Adjustments and/or Additional Dates?

11. 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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Emergency Meeting

**August 16, 2021
9:00 AM**

Deering Building, Room 101
90 Blossom Lane, Augusta, Maine

AGENDA

1. Introductions of Board and Staff
 - Adams, Flewelling, Granger, Jemison, Morrill
2. Proposed Remote Meeting Participation Policy

At the July 16, 2021 meeting, the Board discussed the schedule end of the Governor's State of Civil Emergency on July 30, 2021. Also expiring on July 30, 2021 was the allowance to hold public meetings remotely. During the First Session of the 130th Maine Legislature, LD 32, An Act Regarding Remote Participation in Public Proceedings was signed into law as an emergency measure. To continue to hold meetings remotely, LD 32 requires the Board to adopt a policy stating when remote meetings may be held and how the public may attend and participate.

Presentation By: Megan Patterson, Director

Action Needed: Discussion and vote on adoption of the proposed policy

- Patterson told the Board that LD 32 was signed into law and it formalized the process of holding remote meetings. In response staff drafted a policy in order for the Board to meet remotely. She added that there was also a possibility to hold hybrid meetings so that the public could attend, but the Board could not meet remotely until there was a policy in place. Patterson explained that the term significant distance meant any distance greater than 50 miles for this policy.
- Randlett suggested an edit to the policy that would include an elevated risk of public disease, such as COVID-19.

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- Morrill asked staff to strike out the last sentence of the policy and to strike out sentence one and two under 2(A) in order to leave it broader so that the Board would not be limited to a governor's emergency policy. He added that the issuance of an emergency issue should be determined by the Board or the Board chair.
- Randlett stated that the statute is wide open when it came to what the Board could adopt for policy.
- There was discussion about whether to keep the inclusion of the 50-mile stipulation or to remove it.
- Randlett stated that the statute, in terms of policy, was very broad and wide open however the intent was that these meetings be held in person whenever possible, and the policy should not be so wide open that any member can abstain from a Board meeting.
- Patterson stated that after decline of the Delta variant of COVID-19 Delta, it was the expectation that Board members would be attending meetings in person.
- Morrill responded that he did have concern that the Board would lose the public, in person aspect of the meeting by always attending remotely, and that there was value in meeting face to face.
- Patterson stated that she very much appreciated that the Board convened today on such short notice.
- Morrill asked that staff strike out the meaning of significant distance, which would leave it a bit more up to interpretation. There was further discussion amongst the Board about whether to leave that wording in or not.
- Granger noted that the policy could be changed at any time.
- Patterson stated that she personally saw value in meeting in person as much as possible and that it gave staff the opportunity to have discourse with the Board.
 - **Jemison/Adams: Moved and seconded to adopt the policy, including Section 2(A), but striking sentence one and two after it, and striking the definition of significant distance**
 - **In Favor: Unanimous**
- Jemison stated he would like to formally acknowledge one individual's significant accomplishments in promoting IPM. He stated that Jim Dwyer, UMaine Potato Entomologist, had passed away the previous weekend. He asked if staff could draft a letter of appreciation to his family to acknowledge his contribution to the industry and to the State of Maine. Jemison said he would love to do this, draft a letter, and submit it with a plaque on behalf of the Board.
- Patterson agreed that would be appropriate and noted something similar was done when Carol passed away. The Board also increased the grant to the Maine Mobile Health Program to purchase water bottles and bandanas for migrant workers.
- Flewelling stated that a plaque and letter would be appropriate.

- Morrill also suggested a press release for Jim Dwyer expressing the Board's gratitude for his work.
- Patterson stated that staff would be able to do those things.

3. Adjourn

- **Jemison/Flewelling: Moved and seconded to adjourn at 9:23 AM**
- **In Favor: Unanimous**



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BOARD OF PESTICIDES CONTROL

October 8, 2021

9:00 AM Board Meeting

MINUTES

Adams, Bohlen, Granger, Jemison, Morrill, Waterman

1. Introductions of Board and Staff

- The Board, Staff, and Assistant Attorney General Mark Randlett introduced themselves
- Staff: Boyd, Brown, Bryer, Connors, Couture, Nelson, Patterson, Pietroski, Saucier, Tomlinson

2. Minutes of the August 27, 2021 Board Meeting

Presentation By: Megan Patterson, Director

Action Needed: Amend and/or approve

- **Jemison/Waterman: Moved and seconded to approve minutes as amended**
- **In Favor: Unanimous**

2. Introduction of Dr. Hillary Peterson, Integrated Pest Management Specialist with the Department of Agriculture, Conservation and Forestry

Following a competitive interview process, Dr. Hillary Peterson was hired in August of 2021. Dr. Peterson began serving as the Integrated Pest Management Specialist with the DACF on September 7th. This position was formerly held by Dr. Kathy Murray until April 30, 2021, when she retired after 22+ years of service.

Presentation By: Megan Patterson, Director

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Action Needed: Information only

- Patterson told the Board that Dr. Hillary Peterson was recently hired to fill the IPM Specialist position that was previously held by Kathy Murray.
- Peterson described her educational background, B.S in biology but interested in entomology. Worked with Dr. Frank Drummond when spotted wing drosophila first appeared in Maine and did blueberry and honeybee dissection. She also worked in Dr. Eleanor Groden's lab assisting with winter moth research and completed her undergraduate honors thesis on managing winter moth with natural predators. Peterson expressed a keen interest in parasitoids. She also completed an internship at Smithsonian where she identified and named a new moth species. Before coming to Maine Dr. Peterson worked at Penn State on parasitoids and brown marmorated stink bug management.
- Morrill welcomed Dr. Peterson on behalf of the Board.

4. Staff Memo: Introduction of Laboratory Equipment for Pesticide Analyses

Periodically, EPA makes available funds for expansion of pesticide program laboratory capacity. In 2021, these funds were used to purchase equipment capable of conducting automated ELISA analysis. Staff will now introduce the equipment and its current and future capabilities.

Presentation By: Dr. Pam Bryer, Pesticides Toxicologist

Action Needed: Information only

- Bryer told the Board that her memo introduces a new piece of equipment that tests various compounds via ELISA (enzyme-linked immunosorbent assay) technology. She explained that this process diminishes human error because samples are placed into small well plates pre-loaded with antibodies to test for a specific active ingredient, i.e. glyphosate. The company's technician was recently on campus for two days installing the equipment and training staff. The limit of detection on this equipment is fairly equivalent to the reporting limit of the Montana Ag Lab. Bryer stated that the Board is currently paying about \$200 for each analyte sample sent out for testing and this equipment reduces the cost to about \$25 per sample. She told the board that staff had not yet found glyphosate in any surface water. Also, if there was interest to test for other analytes, the product manufacturer may be able to develop analysis upon request and in as little as two to four months.
- Board members expressed interest in and support for this new acquisition.
- Patterson told the Board that staff brought this idea to them last year and it was paid for by grant funding from EPA that rotates through the New England states about every five years. She stated that the total cost of the equipment was about \$40,000.

5. Staff Memo: Feasible Definition of PFAS in Pesticide Products

LD 264 directs the Board to amend its rules governing registration of pesticides to require two affidavits pertaining to the product containment and product formulation. The first affidavit requires manufacturers and distributors to affirm that the pesticide product they are registering/reregistering has or has not been stored, distributed, or packaged in a fluorinated HDPE container. The second affidavit requires manufacturers to affirm that the pesticide they are registering/reregistering does or does not contain, as a part of its formulation, PFAS. For registrants to attest via these affidavits, the Board must define PFAS. Given the rapidly changing science related to PFAS, staff suggests adoption of a policy that may be referenced in rule.

Presentation By: Dr. Pam Bryer, Pesticides Toxicologist

Action Needed: Discuss and determine the next steps

- Bryer stated that in order for the BPC to implement the resolve from the legislature, staff needed to be able to reference what definition to use when referring to PFAS. Bryer had looked at all the definitions currently out there and anything with at least one fully fluorinated carbon seems to be the simplest definition but that brings the total number of products to around 9,000, which includes some registered pesticides. She told the Board that EPA was trying to figure out how to prioritize efforts within the next five years towards the highest risk chemical structures we should be concerned with first. Currently, this is a list of 75 unique chemicals. Bryer's suggestion was for adoption of this EPA list which she said she anticipated could be hugely unpopular because many organizations were trying to regulate the entire group of chemicals as a class.
- Morrill said the Board really needed to define how they wanted to look at these chemicals and they also had the affidavit portion to consider.
- Patterson stated that this possible definition was one that could be added to the product registration flow to inform people who need to sign the affidavit stating their product does or does not contain these compounds.
- Randlett recommended having a discussion on how the Board wanted to define PFAS, and that it may be possible that part of that definition has a reference to an annual list of products to be identified by the Board. He said that it would make it a little difficult for the enforcement component of the rule but if it was a published policy that was noted in rule he would likely sign off on that.
- Morrill commented on what a fluid and changing topic PFAS was presently.
- Randlett agreed and said this would prevent the Board from having to do rulemaking every time they wanted to add a new product.
- Bohlen said to include a calendar about when the list will be updated annually so as not to catch people off guard.
- Patterson responded that people began renewing products in November, so mid-summer may be a good time to review the list for any needed updates.

- Jemison noted that there were twenty pesticide products on the larger list and asked if anyone knew if any of those were regularly used in agriculture.
- Patterson stated that fipronil was also on the list along with some synthetic pyrethroids.
- Bryer said a total of 9,252 compounds were found in the EPA database with at least one fluorinated carbon.
- Morrill asked if the list of 75 compounds included any registered pesticides.
- Bryer responded that she had not seen any on that list.
- Randlett recommended that staff provide notice to the regulated community of any changes in policy to the list of compounds.
- Adams suggested waiting for Maine Department of Environmental Protection or EPA to create a definition instead of trying to write something themselves.
- Morrill stated he felt that the list was concrete and not over or under-reaching. He said his preference would be to create in rule something that points to policy.
- There was discussion about including in rule wording that explained criteria for determining when and under what circumstances the list may be changed.
- Patterson said that this gave staff something here to work with. She added that she had ongoing concern that this was a moving target and staff would be receiving additional info from EPA and likely DEP. Patterson stated that staff could continue to come back to the Board to try to refine the process.
- Randlett stated that he felt there needed to be something on record that the Board had authorized staff to draft rule and publish or direct staff to direct proposed rule for publication and then hold another meeting so Board can overview.
 - **Jemison/Morrill: Moved and seconded for staff to craft a proposed rule to be reviewed at the next meeting**
 - **In Favor: Unanimous**

6. Review of Potential Rulemaking Concepts Pertaining to LD 155 (neonicotinoids used in residential turf/landscape management) and LD 264 (registration affidavits related to PFAS and container fluorination)

On June 10, 2021 LD 155 and LD 264 were signed into Maine law. LD 155 is a resolve and directs that Board to prohibit the use of any product containing the active ingredients dinotefuran, clothianidin, imidacloprid or thiamethoxam used for application in outdoor residential landscapes such as on lawn, turf, or ornamental vegetation. The resolve directs the Board to provide exemptions for certain applications related to wood preservation, structural pests, pets, and emerging invasive insects. LD 264 is a resolve and directs the Board to amend its rules governing pesticide product registration to require manufacturers and distributors to provide affidavits stating whether the registered pesticide has ever been stored, distributed, or packaged in a fluorinated high-density polyethylene container. It further directs the Board to require manufacturers to provide an affidavit stating whether a polyfluoroalkyl or polyfluoroalkyl substance is in the formulation of the registered pesticide. At its August 27, 2021 meeting, the Board held stakeholder information gathering sessions addressing these two bills. Following the August meeting, the Board directed staff to return with a review of rulemaking concepts.

Presentation By: Megan Patterson, Director

Action Needed: Refine the rulemaking concepts and schedule a hearing

- Patterson described some proposed language for inclusion in rule and pointed the Board toward the document included in the Board packet that explained the difficulties and pitfalls associated with creating a definition for invasive species. In a separate included memo staff suggested two options for an emerging invasive pest definition and listed several concepts that should be included in the rule.
- Patterson said that LD 264 directed the Board to have product registrants attest to two affidavits during the course of registration. She said staff is currently looking at how to implement that functionality in the registration flow. Patterson told the Board that staff will already be requesting each products' confidential statement of formula (CSF) and since it will be collected regularly it should be added into rule.
- Morrill stated that the concepts seemed sound and it was really clear what needed to be done with the affidavits.
- There was discussion about including what the BPC will be considering as a PFAS definition for purpose of the affidavits.
 - **Morrill/Jemison: Moved and seconded for staff to draft language on the affidavits within the process of registration to be to be reviewed at the next meeting**
 - **In Favor: Unanimous**
- The Board discussed the resolve that resulted out of LD 155.
- Patterson stated that staff proposed a very general definition of emerging invasive pests, but after discussion at the last board meeting about term 'emerging', that piece was dropped in the definition presented in the memo in the meeting packet. There was discussion about the Board possibly recognizing emerging invasive pests that would be identified on a list created by the Maine State Horticulturalist and Maine State Entomologist.
- Randlett commented that it should be up to the Board to create its own list rather than recommendations by a third party and another concern was that the Board would be delegating its authority to define emerging invasive species to someone outside the Board.
- Morrill suggested amending section five, fourth bullet, to read 'as created by the BPC'. He asked if emerging invasive pest could be defined in Chapter 41 using that same language.
- Randlett responded that the Board could do a combination of definition in rule that included specific language about certain species and then a list that got updated annually. He added that if there was a good definition that the Board felt comfortable with then there would not be a need for a separate list.

- Bohlen asked if the Board had in this mechanism an effective way to respond to an emerging threat. He added that a list was good but very static, although he was leaning towards some sort of a list due to closeness in definition between pests and invasives.
- Morrill commented that he liked the idea of a definition because it eliminated the need to prepare a list, but also liked the idea of a list as guidance.
- There was discussion about the difficulty of creating a definition and how enforcement would work with it. Morrill asked which option would be easier for staff.
- Patterson said staff could come back with a more considered definition and come up with a proposed list.
- Bohlen brought up the possibility of issuing variances but stated he was not sure about that route either. Morrill stated that he would not support a variance because he felt like that would be creating a whole new bureaucracy. There was further talk about issuing variances and how many variances that could add up to in a year.
- Morrill said he would like the definition reworked and steps detailed regarding how a list of emerging invasive pests would be prepared and how it would be updated annually.
- Adams asked what the net impact would be of changing from regular to restricted use.
- Patterson responded that it would be similar to what has been done in the past with aquatic herbicides because in Maine those products are treated the same way as federally restricted products. She added that the list of aquatic herbicides is published routinely and posted on the BPC website.
- Morrill asked if this would also trigger the training of non-licensed applicators.
- Patterson responded that it would.
- Patterson stated that the first bullet on item five would restrict those neonicotinoids listed in LD 155 and make them restricted use pesticides.
- Granger commented that this was supposed to only be for ornamental uses and asked if making these products restricted would also be taking the option off the table for agricultural users.
- Morrill responded that it was his understanding that it would do that.
- Patterson suggested staff could identify labels that were for outdoor residential landscapes only and make only those products restricted.
- Adams commented that they could possibly protect agriculture via label changes and that would put most of the work on the registrants to figure out how they would want to do this.
- Patterson said that that would still put some burden on staff, especially Tomlinson.
- Tomlinson stated that having language on the label would require a more thorough review of label language like she already does with state restricted aquatic herbicides.

- Adams said that his experience with chemical companies was that they change the name of the product, even though it is an identical formulation, and the new name only has one use on it.
- There was further discussion about how to go about this and the effect on distributors, applicators, and others.
- Morrill asked about restricting the actives through categories, or possibly just specifically exempting agricultural settings from being considered restricted use in rule.
- Adams asked if the Board was mandated to come up with a phase out or if is that was a recommendation.
- Patterson responded that it was a recommendation, but ultimately it will need to be implemented.
- Adams asked if phasing out within two years would result in the manufacturer largely doing the work for us.
- Patterson responded that that would depend on the manufacturer, but staff could reach out to companies with these products that have an ornamental use on them.
- Morrill asked Patterson what the easiest direction was.
- Jemison suggested that since renewals would begin next month it seemed like it would be really difficult to stop the products from being used next year.
- Morrill suggested revisiting this next meeting with a new outline of how and where this may go.
- Patterson asked if that should be in the form of draft rule or not.
- Morrill said he did not think the Board was close enough to a draft rule and that they needed some conceptual ideas in there.

7. 2021 Preliminary Water Quality Monitoring Related to Aerially Applied Herbicides in Forestry

Executive Order 41 FY 20/21 directed the Board to develop a surface water quality monitoring effort to focus on aerial application of herbicides in forestry to be conducted in 2022. In an effort to be responsive to this request and to accommodate what was a changing timeline for completion of the EO request, staff conducted a small preliminary surface water quality monitoring pilot in 2021. Sampling was limited and all samples were collected in advance of planned 2021 aerial applications of herbicides for site preparation and conifer release.

Presentation By: Mary Tomlinson, Pesticide Registrar and Water Quality Specialist

Action Needed: Discuss and provide feedback on results

- The report was not finished at the time of the meeting. Agenda item was postponed until next meeting.

8. Consideration of a Consent Agreement with Central Exterminating Services, Inc.,
Lincolnton, Maine

The Board's Enforcement Protocol authorizes 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 involves an unauthorized application.

Presentation By: Raymond Connors, Manager of Enforcement

Action Needed: Approve/disapprove the consent agreement negotiated by staff

- Connors told the Board that the applicator went to the correct town and street but treated the incorrect address. The owner of the application company self-reported the incident.
- Connors noted that on two documents, the Proposed Administrative Consent Agreement Background Summary, and the Consent Agreement itself, the application date is incorrectly listed as July 11, 2018 and it needs to be changed to June 11, 2018. He added that a monetary penalty of \$1,000 was assessed, which has been the standard for treating the wrong property.
 - **Adams/Jemison: Moved and seconded to approve the consent agreement**
 - **In Favor: Adams, Jemison, Morrill, Waterman**
 - **Abstained: Bohlen**

9. Other Old and New Business

a. Obsolete Pesticide Collection Press Release

- Patterson told the Board that staff procured the services of Tradebe, a new contractor, for the obsolete pesticides collection this year and that they will be at the same pick-up locations during the week of October 18th.

b. LD 1503—An Act to Stop Perfluoroalkyl and Polyfluoroalkyl Substances Pollution

c. EPA's Analytical Chemistry Branch Method for the Analysis of PFAS in an Oily Matrix

- Patterson told the Board that if they should want to enforce against PFAS then staff would need to test for it and this is the only verified analytical method for PFAS analysis in pesticides.

d. Comments in Response to LD 155 and 524 Received After the August Board Meeting

e. Massachusetts Spotted Lanternfly Pest Alert

- Patterson stated that this was included as information only since Spotted Lanternfly is an important agricultural pest.

f. Medical Advisory Committee Update

- Staff is currently compiling information for the MAC to use regarding applications that were made this year and last year on school grounds.

g. Other items?

- Randlett told the Board that there had been discussion about in-person meetings and right now under policy there was an emergency that provided for remote meetings. He said that in order to return to regular in person meetings the Board would need to officially rescind that determination that the emergency exists.
- Morrill stated that could be added as an agenda item and discussed at every meeting.
- Randlett responded that that was the Board's option, and they could decide whether they wanted to continue to meet remotely.
- Patterson stated she could add it as an agenda item under 'Schedule of Future Meetings' and the Board could decide whether each meeting would be held in person or remotely.
- Jemison asked if the Board were to decide to change things back would there still be an option for a member driving long distances to attend remotely if there was inclement weather.
- Morrill responded that yes, that was covered in the policy.

10. Schedule of Future Meetings

The Board will decide whether to change and/or add dates.

- The next Board meeting is tentatively scheduled for November 19, 2021.
- The Board consensus was to remove the scheduled December meeting since there was not enough time to get information to the Secretary of State and publish notice of the public hearing in the newspapers.
- Patterson stated that the Agricultural Trade Show was scheduled to be an in person event to be held January 11-13, 2022.

11. Adjourn

- **Granger/Adams: Moved and seconded to adjourn at 11:25 AM**
- **In Favor: Unanimous**



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JANET T. MILLS
GOVERNOR

AMANDA E. BEAL
COMMISSIONER

To: Board of Pesticides Control Members
From: Mary Tomlinson, Pesticides Registrar/Water Quality Specialist
RE: Extension of EPA SLN [FIFRA, Section 24(c)] request to extend use of Arsenal Herbicide
Applicators Concentrate, EPA Reg. No. 241-299, to allow increased surfactant rate when used
in combination with glyphosate for Jack pine, red spruce and white spruce release

Date: November 9, 2021

Ronald Lemin, Jr., Vegetation Management Sales Consultant, Nutrien Solutions, is requesting the SLN (Special Local Needs) registration for Arsenal Herbicide Applicators Concentrate, be extended. No changes have been made in the SLN label. The current EPA label specifies a maximum surfactant concentration of 0.25% (v/v) for conifer release. The SLN allows the increased rate of surfactants for tank mixes of Arsenal and glyphosate which maximizes the effectiveness of glyphosate.

The request is for two years, bridging the gap as BASF revises the label to include the use and begins production and distribution.

The section 3 product label is registered for multiple sites, including use as an aquatic herbicide. Pam Byer, Ph.D., BPC toxicologist has indicated the rate under this SLN should not cause any undue harm to humans or the environment.

Please review the attached documents and let me know if you have any questions.

- Letter of request from Ronald Lemin, Jr.
- Letter of support from Effie Toren, Registration Specialist, BASF
- Current Arsenal SLN label
- Arsenal EPA label
- Arsenal Section 3 label
- Arsenal SDS

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PHONE: (207) 287-2731
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*Ronald C. Lemin, Jr.
Vegetation Management Sales Consultant
291 Lincoln Street
Bangor, Maine 04401
207-944-6160 (m)
Ronald.lemine@nutrien.com*

November 8, 2021

Maine Board of Pesticide Control
Attn: Mary Tomlinson
28 State House Station
Augusta, ME 04333-0028

Dear Ms. Tomlinson,

I am writing this letter of request to extend the registration of EPA SLN NO. ME-040001 for Arsenal Applicators Concentrate (BASF, EPA Registration Number 241-299) in Maine. Since 2004, the forestry community in Maine has been using this label for aerial softwood release on 10-12,000 acres annually. The current Arsenal Applicators Concentrate label allows for a maximum nonionic surfactant concentration of 0.25% v/v. When releasing conifers at 8 to 10 gallons per acre, this represents only 2.6 to 3.2 ounces of surfactant per acre. The Arsenal label also requires 6-12 ounces of Arsenal per acre for spruce release, however in Maine we are using only 1-1.5 ounces of Arsenal Applicators Concentrate tank mixed with 1.5-2.25 quarts of Rodeo or Roundup Custom. Consequently, the bulk of the active ingredient (glyphosate) will not perform adequately at this lower surfactant level.

At the current labeled rate of surfactant (0.25% v/v) and using the tank mixes of 1.5 -2.25 quarts of Rodeo or Roundup Custom and 1-1.5 ounces of Arsenal A.C., the result would be a significant loss of efficacy. This would result in an increase in poor performance claims with re-treatment of acreage annually. This increased surfactant rate has been used historically since 2004 with great success. I feel it is essential to maintain this SLN NO. ME-040001 until it can be incorporated into the primary Arsenal Applicators Concentrate label upon reregistration.

Thank you for your time and consideration. If you have any further questions, please feel free to contact me at the address below.

Sincerely,

A handwritten signature in black ink, appearing to read "Ronald C. Lemin, Jr.", written in a cursive style.

Ronald C. Lemin, Jr.
Vegetation Management Consultant, Nutrien Solutions
Licensed Professional Forester, ME, NH
SAF Certified Forester
Maine Licensed Applicator



We create chemistry

Agricultural Solutions

November 8, 2021

Mary Tomlinson
Board of Pesticide Control
Maine Department of Agriculture
28 State House Station
Augusta, ME 04333-0028

**Re: Arsenal® Applicators Concentrate Herbicide, EPA Reg. No. 241-299
Section 24(c) Registration**

Dear Ms. Tomlinson,

Enclosed is revised Section 24(c) labeling (coded NVA 2021-04-104-0221) extending the expiration date for labeling allowing the use of an increased concentration of nonionic surfactant when **Arsenal Applicators Concentrate** is used in tank mix concentrations with glyphosate for the purpose forestry conifer release.

There is a previous 24(c) label granted (SLN No. ME-040001) which is set to expire on December 31, 2021. BASF plans to submit amended Section 3 labeling to the US EPA, but it will take at least two years to achieve EPA acceptance and to incorporate those changes into production on product containers. This 24(c) request is to maintain the ability of the increased concentration of nonionic surfactant use with glyphosate tank mixes while BASF incorporates the use into Section 3 labeling.

Thank you very much. Please contact me at 919-724-1350 or effie.toren@basf.com if you require anything else.

Sincerely,
BASF Corporation

A handwritten signature in blue ink, appearing to read "Effie Toren".

Effie Toren
State Registration Manager

Encl.

BASF Corporation
26 Davis Drive, PO Box 13528
Research Triangle Park
NC 27709-3528
Tel: (919) 547-2000
www.basf.com/usa

Helping Make Products Better™

For distribution and use only in the state of Maine

Imazapyr	Group	2	Herbicide
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**FIFRA Sec. 24(c)
Special Local Need Label**

ARSENAL[®]
herbicide
APPLICATORS CONCENTRATE

For Jack Pine, Black Spruce, Red Spruce, and White Spruce release

This special local need label expires on December 31, 2023 and must not be used or distributed after this date.

Active Ingredient:

Isopropylamine salt of imazapyr: (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid)*	53.1%
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Other Ingredients:	46.9%
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Total:	100.0%
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*Equivalent to 43.3% 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid or 4 pounds acid per gallon

EPA Reg. No. 241-299

EPA SLN No. ME-040001

CAUTION

Directions For Use

Refer to the Arsenal[®] herbicide Applicators Concentrate main label, EPA Reg. No. 241-299, for complete Directions For Use and all applicable restrictions and precautions. When following the instructions on this label, the user must have this label and the entire Arsenal herbicide Applicators Concentrate container label in possession at the time of pesticide application.

It is a violation of federal law to use this product in a manner inconsistent with its labeling.

Application Methods

Conifer Release Treatment

Arsenal[®] herbicide Applicators Concentrate may be used to release Jack Pine, Black Spruce, Red Spruce and White Spruce from labeled brush, vine,

grass, and broadleaf weeds at rates less than 6 fl ozs/A when tank mixed with glyphosate.

A nonionic surfactant may be tank mixed at rates greater than 0.25% v/v when using less than 6 fl ozs/A of **Arsenal herbicide Applicators Concentrate**. The use of **Arsenal herbicide Applicators Concentrate** with more than 0.25% v/v nonionic surfactant can result in conifer growth inhibition or mortality, and should not be used if this type of conifer injury cannot be tolerated.

The use of **Arsenal herbicide Applicators Concentrate** rates below 6 fl ozs/A are intended for hardwood brush growth suppression and hardwood brush resprouting should be expected.

Conditions of Sale and Warranty

The **Directions For Use** of this product reflect the opinion of experts based on field use and tests. The directions are believed to be reliable and must be followed carefully. However, it is impossible to eliminate all risks inherently associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or use of the product in a manner inconsistent with its labeling, all of which are beyond the control of BASF CORPORATION ("BASF") or the Seller. To the extent consistent with applicable law, all such risks shall be assumed by the Buyer.

BASF warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes referred to in the **Directions For Use**, subject to the inherent risks, referred to above.

TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BASF MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS OR MERCHANTABILITY OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BUYER'S EXCLUSIVE REMEDY AND BASF'S EXCLUSIVE LIABILITY, WHETHER IN CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY, OR OTHERWISE, SHALL BE LIMITED TO REPAYMENT OF THE PURCHASE PRICE OF THE PRODUCT.

TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BASF AND THE SELLER DISCLAIM ANY LIABILITY FOR CONSEQUENTIAL, EXEMPLARY, SPECIAL OR INDIRECT DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT.

BASF and the Seller offer this product, and the Buyer and User accept it, subject to the foregoing **Conditions of Sale and Warranty** which may be varied only by agreement in writing signed by a duly authorized representative of BASF.

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Arsenal is a registered trademark of BASF.

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000241-00299.20211108.NVA 2021-04-104-0221
Supersedes NVA 2016-04-104-0203

24(c) registrant:
BASF Corporation
26 Davis Drive
Research Triangle Park, NC 27709


We create chemistry

Arsenal[®]

Herbicide

Applicators Concentrate

For the control of undesirable vegetation growing within specified aquatic sites, forestry sites, pasture/rangeland, and nonagricultural lands; and for the establishment and maintenance of wildlife openings, release of unimproved Bermudagrass and Bahiagrass, bareground weed control, and for use under certain paved surfaces

Active Ingredient:

isopropylamine salt of imazapyr: (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid) * 53.1%

Other Ingredients: 46.9%

Total: 100.0%

* Equivalent to 43.3% 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid or 4 pounds acid per gallon

EPA Reg. No. 241-299

EPA Est. No. 241-PR-002

KEEP OUT OF REACH OF CHILDREN CAUTION/PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

FIRST AID: If swallowed: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. **DO NOT** induce vomiting unless told to by a poison control center or doctor. **DO NOT** give anything to an unconscious person. **If on skin or clothing:** Take off contaminated clothing. Rinse skin immediately with plenty of water for 15 to 20 minutes. Call a poison control center or doctor for treatment advice. **If inhaled:** Move person to fresh air. If person is not breathing, call 911 or an ambulance; then give artificial respiration, preferably by mouth to mouth, if possible. Call a poison control center or doctor for further treatment advice. **If in eyes:** Hold eyes open and rinse slowly and gently with water for 15 to 20 minutes. Remove contact lenses, if present, after first 5 minutes; then continue rinsing eyes. Call a poison control center or doctor for treatment advice. **HOTLINE NUMBER:** Have the product container or label with you when calling a poison control center or doctor or going for treatment. In case of an emergency endangering life or property involving this product, call BASF Corporation for emergency medical treatment information, day or night 1-800-832-HELP (4357).

See inside booklet for complete **Precautionary Statements, Directions For Use, Conditions of Sale and Warranty**, and state-specific crop and/or use site restrictions.

Net Contents: **2.5 Gallons**

81045263 NVA 2017-05-104-0198
Product of U.S.A.

BASF Corporation
26 Davis Drive
Research Triangle Park, NC 27709


We create chemistry

FIRST AID

If swallowed	<ul style="list-style-type: none">• Call a poison control center or doctor immediately for treatment advice.• Have person sip a glass of water if able to swallow.• DO NOT induce vomiting unless told to by a poison control center or doctor.• DO NOT give anything to an unconscious person.
If on skin or clothing	<ul style="list-style-type: none">• Take off contaminated clothing.• Rinse skin immediately with plenty of water for 15 to 20 minutes.• Call a poison control center or doctor for treatment advice.
If inhaled	<ul style="list-style-type: none">• Move person to fresh air.• If person is not breathing, call 911 or an ambulance; then give artificial respiration, preferably by mouth to mouth, if possible.• Call a poison control center or doctor for further treatment advice.
If in eyes	<ul style="list-style-type: none">• Hold eyes open and rinse slowly and gently with water for 15 to 20 minutes.• Remove contact lenses, if present, after first 5 minutes; then continue rinsing eyes.• Call a poison control center or doctor for treatment advice.

HOTLINE NUMBER

Have the product container or label with you when calling a poison control center or doctor or going for treatment. In case of an emergency endangering life or property involving this product, call BASF Corporation for emergency medical treatment information, day or night 1-800-832-HELP (4357).

Precautionary Statements

Hazards to Humans and Domestic Animals

CAUTION. Harmful if swallowed. Avoid contact with skin, eyes, or clothing. Avoid breathing spray mist.

Personal Protective Equipment (PPE)

Mixers, loaders, applicators, and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks
- Chemical-resistant gloves made of any waterproof material such as barrier laminate, butyl rubber ≥ 14 mils, nitrile rubber ≥ 14 mils, neoprene rubber ≥ 14 mils, natural rubber ≥ 14 mils, polyethylene, polyvinyl chloride ≥ 14 mils, or viton ≥ 14 mils

Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions are given for washables, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. **DO NOT** reuse them.

Engineering Controls

Pilots must use an enclosed cockpit that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(6)].

USER SAFETY RECOMMENDATIONS

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

Physical and Chemical Hazards

Spray solutions of **Arsenal® herbicide Applicators Concentrate** must be mixed, stored and applied only in stainless steel, fiberglass, plastic and plastic-lined steel containers.

Thoroughly clean application equipment, including landing gear, immediately after use of this product. Prolonged exposure of this product to uncoated steel (except stainless steel) surfaces may result in corrosion and failure of the exposed part. The maintenance of an organic coating (paint) may prevent corrosion.

Environmental Hazards

This product is toxic to plants. Drift and runoff may be hazardous to plants in water adjacent to treated areas. **DO NOT** apply to water except as specified in this label. Treatment of aquatic weeds may result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss may cause the suffocation of some aquatic organisms. **DO NOT** treat more than 1/2 of the surface area of the water in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow aquatic organisms to move into untreated areas. **DO NOT** contaminate water when disposing of equipment washwaters or rinsate.

This pesticide is toxic to vascular plants and must be used strictly in accordance with the drift precautions on the label.

Directions For Use

It is a violation of federal law to use this product in a manner inconsistent with its labeling.

Arsenal herbicide Applicators Concentrate must be used only in accordance with the instructions on the leaflet label attached to the container. Keep containers closed to avoid spills and contamination.

DO NOT apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

DO NOT enter or allow worker entry into treated areas during the restricted-entry interval (REI) of **48 hours**.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Shoes plus socks
- Chemical-resistant gloves made of any waterproof material
- Protective eyewear

NONAGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

DO NOT enter or allow others to enter treated areas until sprays have dried.

STORAGE AND DISPOSAL

DO NOT contaminate water, food or feed by storage or disposal.

Pesticide Storage

DO NOT store below 10° F.

Pesticide Disposal

Wastes resulting from the use of this product must be disposed of on-site or at an approved waste disposal facility.

Container Handling

Nonrefillable Container. DO NOT reuse or refill this container.

Triple rinse or pressure rinse container (or equivalent) promptly after emptying; then offer for recycling, if available, or reconditioning, if appropriate, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures approved by state and local authorities.

Triple rinse containers small enough to shake (capacity ≤ 5 gallons) as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank, or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times.

(continued)

STORAGE AND DISPOSAL (continued)

Container Handling (continued)

Triple rinse containers too large to shake (capacity > 5 gallons) as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank, or store rinsate for later use or disposal. Repeat this procedure two more times.

Pressure rinse as follows: Empty the remaining contents into application equipment or mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank, or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container and rinse at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

Refillable Container. Refill this container with pesticide only. **DO NOT** reuse this container for any other purpose. Triple rinsing the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller.

Triple rinse as follows: To clean the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container about 10% full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times.

When this container is empty, replace the cap and seal all openings that have been opened during use; return the container to the point of purchase or to a designated location. This container must only be refilled with a pesticide product. Prior to refilling, inspect carefully for damage such as cracks, punctures, abrasions, worn-out threads and closure devices. Check for leaks after refilling and before transport. **DO NOT** transport if this container is damaged or leaking. If the container is damaged, or leaking, or obsolete and not returned to the point of purchase or to a designated location, triple rinse emptied container and offer for recycling, if available, or dispose of container in compliance with state and local regulations.

In Case of Emergency

In case of large-scale spillage regarding this product, call:

- CHEMTREC 1-800-424-9300
- BASF Corporation 1-800-832-HELP (4357)

In case of medical emergency regarding this product, call:

- Your local doctor for immediate treatment
- Your local poison control center (hospital)
- BASF Corporation 1-800-832-HELP (4357)

Steps to be taken in case material is released or spilled:

- Dike and contain the spill with inert material (sand, earth, etc.) and transfer liquid and solid diking material to separate containers for disposal.
- Remove contaminated clothing and wash affected skin areas with soap and water.
- Wash clothing before reuse.
- Keep the spill out of all sewers and open bodies of water.

Product Information

Arsenal® herbicide Applicators Concentrate is an aqueous solution to be mixed with water and a surfactant and applied as a spray solution to control undesirable vegetation growing within specified aquatic sites, forestry sites, pasture/rangeland and nonagricultural lands. Aquatic sites consist of standing and flowing water, estuarine/marine, wetland, and riparian areas. Nonagricultural lands include private, public and military lands as follows: uncultivated nonagricultural areas (including airports, highway, railroad and utility rights-of-way, sewage disposal areas, etc.); uncultivated agricultural areas - noncrop producing (including farmyards, fuel storage areas, fence rows, nonirrigation ditchbanks, barrier strips, etc.); industrial sites - outdoor (including lumberyards, pipeline and tank farms, etc.); and natural areas (including wildlife management areas, wildlife openings, wildlife habitats, recreation areas, campgrounds, trailheads, and trails).

Arsenal herbicide Applicators Concentrate may also be used for the release of unimproved Bermudagrass and Bahiagrass, for bareground weed control, and for use under certain paved surfaces.

Herbicidal Activity

Arsenal herbicide Applicators Concentrate will control most annual and perennial grass and broadleaf weeds in addition to many brush and vine species with some residual control of undesirable species that germinate above the waterline. **Arsenal herbicide Applicators Concentrate** is readily absorbed through emergent leaves and stems and is translocated rapidly throughout the plant with accumulation in the meristematic regions. For maximum activity, weeds should be growing vigorously at the time of application, and the spray solution should include a surfactant (see **Adjuvants** section for specific use directions). Treated plants stop growing soon after spray application. Chlorosis appears first in the newest leaves, and necrosis spreads from this point. In perennials, the herbicide is translocated into, and kills, underground or submerged storage organs, which prevents regrowth. Chlorosis and tissue necrosis may not be apparent in some plant species until 2 or more weeks after application. Complete kill of plants may not occur for several weeks. **Arsenal herbicide Applicators Concentrate** applications are rainfast 1 hour after treatment.

Use Information

Applications may be made for the control of undesirable vegetation growing within specified aquatic sites, forestry sites, pasture/rangeland and nonagricultural lands. Aquatic sites consist of standing and flowing water; estuarine/marine, wetland, and riparian areas; for control of most annual and perennial grass weeds, broadleaf weeds, vines and brambles, and hardwood brush and trees for forestry site preparation and release of conifers from woody and herbaceous competition. **Arsenal herbicide Applicators Concentrate** may be used for selective woody and herbaceous weed control in natural regeneration of certain conifers (see **Conifer Release Treatment**).

Nonagricultural lands include private, public and military lands as follows: uncultivated nonagricultural areas (including airports, highway, railroad and utility rights-of-way, sewage disposal areas, etc.); uncultivated agricultural areas - noncrop producing (including farmyards, fuel storage areas, fence rows, nonirrigation ditchbanks, barrier strips, etc.); industrial sites - outdoor (including lumberyards, pipeline and tank farms, etc.); and natural areas (including wildlife management areas, wildlife openings, wildlife habitats, recreation areas, campgrounds, trailheads, and trails).

Precautions

- Keep from contact with fertilizers, insecticides, fungicides and seeds.
- Clean application equipment after using this product by thoroughly flushing with water.

Restrictions

- **DO NOT** use on food crops.
- **DO NOT** apply this product within 1/2 mile upstream of an active potable water intake in flowing water (i.e. river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water, such as a lake, pond, or reservoir.
- **DO NOT** apply to water used for irrigation except as described in **Product Use Precautions and Restrictions** section of this label.
- **DO NOT** drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the treated soil may be washed or moved into contact with their roots.
- **DO NOT** use on lawns, walks, driveways, tennis courts, or similar areas.
- **DO NOT** side trim desirable vegetation with this product unless severe injury and plant death can be tolerated. Prevent drift of spray to desirable plants.

Site Specific Restrictions

Nonagricultural Lands and Forestry Sites

- **DO NOT** apply more than 1.5 lbs acid equivalent (ae) imazapyr (equivalent to 48 fl ozs of **Arsenal herbicide Applicators Concentrate**) per acre per year.

Pasture/Rangeland Sites

- For spot treatment only.
- **DO NOT** treat more than 1/10 of the available area to be grazed or cut for hay.
- **DO NOT** apply more than 0.75 lb ae imazapyr (equivalent to 24 fl ozs of **Arsenal herbicide Applicators Concentrate**) per acre per year.

Aquatic Sites

- **DO NOT** apply more than 1.5 lbs ae imazapyr (equivalent to 48 fl ozs of **Arsenal herbicide Applicators Concentrate**) per acre per year.
- **Public waters** - Application of **Arsenal herbicide Applicators Concentrate** to water can only be made by federal or state agencies, such as Water Management District personnel, municipal officials, and the U.S. Army Corps of Engineers, or those applicators who are licensed or certified as aquatic pest control applicators and are authorized by the state or local government. Treatment to other than non-native invasive species is limited to only those plants that have been determined to be a nuisance by a federal or state government entity.
- **Aerial application** - Aerial application to aquatic sites is restricted to helicopter only.
- **Irrigation water** - Application to water used for irrigation that results in **Arsenal herbicide Applicators Concentrate** residue greater than 1.0 ppb **MUST NOT** be used for irrigation purposes for 120 days after application or until **Arsenal herbicide Applicators Concentrate** residue levels are determined by laboratory analysis or other appropriate means of analysis to be 1.0 ppb or less. When applications are made within 500 feet of an active irrigation intake, **DO NOT** irrigate for at least 24 hours following application to allow for dissipation.

Recreational Use of Water in Treatment Area

There are no restrictions on the use of water in the treatment area for recreational purposes, including swimming and fishing.

Livestock Use of Water in/from Treatment Area

There are no restrictions on livestock consumption of water from the treatment area.

Potable Water Intakes

DO NOT apply **Arsenal® herbicide Applicators Concentrate** directly to water within 1/2 mile upstream of an active potable water intake in flowing water (i.e. river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as a lake, pond, or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake **must** be turned off during application and for a minimum of 48 hours after the application. These aquatic applications may be made only in the cases where there are alternative water sources or holding ponds that would permit the turning off of an active potable water intake for a minimum period of 48 hours after the applications.

NOTE: Existing potable water intakes that are no longer in use, such as those replaced by connections to wells or a municipal water system, are not considered to be active potable water intakes. This restriction does not apply to intermittent, inadvertent overspray of water in terrestrial use sites.

Quiescent or Slow-moving Waters

In lakes and reservoirs, **DO NOT** apply **Arsenal herbicide Applicators Concentrate** within one (1) mile of an active irrigation water intake during the irrigation season. Applications less than one (1) mile from an active irrigation water intake may be made during the off-season, provided that the irrigation intake will remain inactive for a minimum of 120 days after application or until **Arsenal herbicide Applicators Concentrate** residue levels are determined by laboratory analysis or other appropriate means of analysis to be 1.0 ppb or less.

Avoiding Injury to Nontarget Plants

If treated vegetation is to be removed from the application site, **DO NOT** use the vegetative matter as mulch or compost on or around desirable species.

Precautions for Avoiding Injury to Nontarget Plants

Untreated desirable plants can be affected by root uptake of **Arsenal herbicide Applicators Concentrate** from treated soil. Injury or loss of desirable plants may result if **Arsenal herbicide Applicators Concentrate** is applied on or near desirable plants, on areas where their roots extend, or in locations where the treated soil may be washed or moved into contact with their roots. When making application along shorelines where desirable plants may be present, use caution to avoid spray contact with their foliage or spray application to the soil in which they are rooted. Shoreline plants that have roots which extend into the water in an area where **Arsenal herbicide Applicators Concentrate** has been applied generally will not be adversely affected by uptake of the herbicide from the water.

Managing Off-target Movement

Aerial Application

- Applicators are required to use a coarse or coarser droplet size (ASABE S572) or, if specifically using a spinning atomizer nozzle, applicators are required to use a volume mean diameter (VMD) of 385 microns or greater for release heights below 10 feet. Applicators are required to use a very coarse or coarser droplet size or, if specifically using a spinning atomizer nozzle, applicators are required to use a VMD of 475 microns or greater for release heights above 10 feet. Applicators must consider the effects of nozzle orientation and flight speed when determining droplet size.
- Applicators are required to use upwind swath displacement.
- The boom length must not exceed 60% of the wingspan or 90% of the rotor blade diameter to reduce spray drift.
- Applications with wind speeds less than 3 mph and with wind speeds greater than 10 mph are prohibited.
- Applications into temperature inversions are prohibited.

Ground Boom Application

- Applicators are required to use a nozzle height below 4 feet above the ground or plant canopy and coarse or coarser droplet size (ASABE S572) or, if specifically using a spinning atomizer nozzle, applicators are required to use a volume mean diameter (VMD) of 385 microns or greater.
- Applications with wind speeds greater than 10 mph are prohibited.
- Applications into temperature inversions are prohibited.

Wind Erosion

Avoid treating powdery, dry or light sandy soils when conditions are favorable for wind erosion. Under these conditions, the soil surface should first be settled by rainfall or irrigation.

Adjuvants

Postemergence applications of **Arsenal herbicide Applicators Concentrate** require the addition of a spray adjuvant. When making aquatic applications, only spray adjuvants approved or appropriate for aquatic use must be utilized.

Nonionic Surfactant

Use a nonionic surfactant (NIS) at the rate of 0.25% volume/volume (v/v) or higher (see manufacturer's label) of the spray solution (0.25% v/v is equivalent to 1 quart in 100 gallons). For best results, select a nonionic surfactant with an HLB (hydrophilic to lipophilic balance) ratio between 12 and 17 with at least 70% surfactant in the formulated product. Alcohols, fatty acids, oils, ethylene glycol or diethylene glycol should not be considered as surfactants to meet the above requirements.

Methylated Seed Oil or Vegetable Oil Concentrate

Instead of a surfactant, a methylated seed oil (MSO) or vegetable-based seed oil concentrate may be used at the rate of 1.5 to 2 pints per acre. When using spray volumes greater than 30 gallons per acre, methylated seed oil or vegetable-based seed oil concentrates should be mixed at a rate of 1% of the total spray volume, or alternatively use a nonionic surfactant as described above. Research indicates that these oils may aid in **Arsenal herbicide Applicators Concentrate** deposition and uptake by plants under moisture or temperature stress.

Silicone-based Surfactant

See manufacturer's label for specific rates. Silicone-based surfactants may reduce the surface tension of the spray droplet allowing greater spreading on the leaf surface as compared to conventional nonionic surfactants. However, some silicone-based surfactants may dry too quickly, limiting herbicide uptake.

Invert Emulsions

Arsenal herbicide Applicators Concentrate can be applied as an invert emulsion. The spray solution results in an invert (water-in-oil) spray emulsion designed to minimize spray drift and spray runoff, resulting in more herbicide on the target foliage. The spray emulsion may be formed in a single tank (batch mixing) or injected (in-line mixing). Consult the invert chemical label for proper mixing directions.

Other

An antifoaming agent, spray pattern indicator, or drift-reducing agent may be applied at the product labeled rate if necessary or desired.

Tank Mixes

Arsenal herbicide Applicators Concentrate may be tank mixed with other herbicides.

Consult manufacturer's labels for specific rate restrictions and weeds controlled. Always follow the more restrictive label restrictions and precautions for all products used when making an application involving tank mixes.

Application Methods

Arsenal® herbicide Applicators Concentrate may be selectively applied using low-volume directed application techniques or may be broadcast-applied using ground equipment, watercraft, or aircraft. Aerial applications to aquatic sites must be made by helicopter. In addition, **Arsenal herbicide Applicators Concentrate** may also be applied using cut-stump, cut-stem, and frill or girdle treatment techniques within nonagricultural lands, pasture/rangeland, and aquatic sites (see **Aerial Application** and **Ground Application** sections for additional details).

Aerial Application

All precautions must be taken to minimize or eliminate spray drift. Both fixed-wing aircraft and helicopters can be used to apply **Arsenal herbicide Applicators Concentrate** on nonagricultural lands, but only helicopters can be used for aquatic applications. **DO NOT** make applications by fixed-wing aircraft or helicopter unless appropriate buffer zones can be maintained to prevent spray drift out of the target area, or when treating open tracts of land, spray drift as a result of fixed-wing aircraft application can be tolerated. Aerial equipment designed to minimize spray drift, such as a helicopter equipped with a **Microfoil™ boom**, **Thru-Valve™ boom**, or rain-drop nozzles, must be used and calibrated. Except when applying with a **Microfoil boom**, a drift control agent may be added at the specified label rate. **DO NOT** side trim with **Arsenal herbicide Applicators Concentrate** unless death of treated tree can be tolerated.

Uniformly apply the specified amount of **Arsenal herbicide Applicators Concentrate** in 2 to 30 gallons of water per acre. A foam-reducing agent may be added at the specified label rate, if needed.

Thoroughly clean application equipment, including landing gear, immediately after use of this product. Prolonged exposure of this product to uncoated steel (except stainless steel) surfaces may result in corrosion and failure of the exposed part. The maintenance of an organic coating (paint) may prevent corrosion.

Ground Application

Foliar Application

Low-volume Foliar Application

Use equipment calibrated to deliver 5 to 20 gallons of spray solution per acre. To prepare the spray solution, thoroughly mix in water 0.25% to 2.50% **Arsenal herbicide Applicators Concentrate** plus surfactant (see the **Adjuvants** section of this label for specific use directions). A foam-reducing agent may be applied at the specified label rate, if needed. For control of difficult species (see **Aquatic Weeds Controlled** section and the **Terrestrial Weeds Controlled** section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes, but **DO NOT** apply more than 3 pints of **Arsenal herbicide Applicators Concentrate** per acre in aquatic sites and nonagricultural lands and 1.5 pints per acre in pasture/rangeland. Excessive wetting of foliage is not necessary.

For low-volume foliar application, select proper nozzles to avoid overapplication. Proper application is critical to ensure desirable results. Best results are achieved when the spray covers the crown and approximately 70 percent of the plant. The use of an even, flat-fan tip with a spray angle of 40 degrees or less will aid in proper deposition.

Appropriate tip sizes include 4004E or 1504E. For a straight-stream and cone pattern, adjustable cone nozzles, such as 5500 X3 or 5500 X4, may be used. Attaching a rollover valve onto a Spraying Systems Model 30 gun-jet or other similar spray gun allows for the use of both flat-fan and cone tips on the same gun.

Moisten, but **DO NOT** drench target vegetation causing spray solution to run off.

Low-volume Foliar Application with Backpack. For low-growing species, spray down on the crown, covering crown and penetrating approximately 70% of the plant.

For target species 4 to 8 feet tall, swipe the sides of target vegetation by directing spray to at least 2 sides of the plant in smooth vertical motions from the crown to the bottom. Make sure to cover the crown whenever possible.

For target species over 8 feet tall, lace sides of the target vegetation by directing spray to at least 2 sides of the target in smooth zigzag motions from crown to bottom.

Low-volume Foliar Application with Hydraulic Handgun Application Equipment. Use the same technique as described above for **Low-volume Foliar Application with Backpack**.

For broadcast applications, simulate a gentle rain near the top of target vegetation allowing spray to contact the crown and penetrate the target foliage without falling to the understory. Herbicide spray solution that contacts the understory may result in severe injury or death of plants in the understory.

High-volume Foliar Application

For optimum performance when spraying medium-density to high-density vegetation, use equipment calibrated to deliver up to 100 gallons of spray solution per acre (GPA). Spray solutions exceeding 100 GPA may result in excessive spray runoff, causing increased ground cover injury and injury to desirable species. To prepare the spray solution, thoroughly mix **Arsenal herbicide Applicators Concentrate** in water and add a surfactant (see **Adjuvants** section for specific use directions and rates for surfactants). A foam-reducing agent may be added at the specified label rate, if needed.

For control of difficult species (see **Aquatic Weeds Controlled** chart and the **Terrestrial Weeds Controlled** section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes, but **DO NOT** apply more than 3 pints of **Arsenal herbicide Applicators Concentrate** per acre in aquatic sites and nonagricultural lands and 1.5 pints per acre in pasture/rangeland. Uniformly cover the foliage of the vegetation to be controlled, but **DO NOT** apply to runoff. Excessive wetting of foliage is not necessary.

Side Trimming

DO NOT side trim with **Arsenal herbicide Applicators Concentrate** unless severe injury or death of the treated tree can be tolerated. **Arsenal herbicide Applicators Concentrate** is readily translocated and can result in death of the entire tree.

Cut-surface Treatment

Arsenal herbicide Applicators Concentrate may be used to control undesirable woody vegetation by applying the **Arsenal herbicide Applicators Concentrate** solution to the cambium area of freshly cut stump surfaces or to fresh cuts on the stem of the target woody vegetation. Applications can be made at any time of the year except during periods of heavy sap flow in the spring. **DO NOT** overapply solution causing runoff from the cut surface.

Injury may occur to desirable woody plants if the shoots extend from the same root system or their root systems are grafted to those of the treated tree.

Cut-surface Application with Dilute and Concentrate Solutions

Arsenal® herbicide Applicators Concentrate may be mixed as either a concentrate or dilute solution. The dilute solution may be used for applications to the cut surface of the stump or to cuts on the stem of the target woody vegetation. Concentrate solutions may be used for applications to cuts on the stem. Use of the concentrate solution permits application to fewer cuts on the stem, especially for large-diameter trees. Follow the application instructions for proper application techniques for each type of solution.

- To prepare a dilute solution, mix 4 to 6 fluid ounces of **Arsenal herbicide Applicators Concentrate** with 1 gallon of water. A surfactant or penetrating agent may improve uptake through partially callused cambiums.
- To prepare a concentrate solution, mix 1 quart of **Arsenal herbicide Applicators Concentrate** with no more than 1 pint of water.

Cut-stump Treatment

Dilute Solution. Spray or brush the solution onto the cambium area of the freshly cut stump surface. Ensure that the solution thoroughly wets the entire cambium area (the wood next to the bark of the stump).

Cut-stem Treatment (injection, hack-and-squirt)

Dilute Solution. Using standard injection equipment, apply 1 milliliter of solution at each injection site around the tree with no more than 1-inch intervals between cut edges. Ensure that the injector completely penetrates the bark at each injection site.

Concentrate Solution. Using standard injection equipment, apply 1 milliliter of solution at each injection site. Make at least 1 injection cut for every 3 inches of diameter at breast height (DBH) on the target tree. For example, a 3-inch DBH tree will receive 1 injection cut, and a 6-inch DBH tree will receive 2 injection cuts. On trees requiring more than 1 injection site, place the injection cuts at approximately equal intervals around the tree.

Frill or Girdle Treatment

Using a hatchet, machete, or chainsaw, make cuts through the bark and completely around the tree to expose the cambium. The cut should angle downward extending into the cambium enough to expose at least 2 growth rings. Using a spray applicator or brush, apply a 12.5% to 50.0% solution of **Arsenal herbicide Applicators Concentrate** into each cut until thoroughly wet. Avoid applying so much herbicide that runoff to the ground or water occurs.

Forestry Use

Site Preparation Treatment

Arsenal herbicide Applicators Concentrate may be used to control labeled grass weeds, broadleaf weeds, vines and brambles, and woody brush and trees on forest sites in advance of regeneration for the following conifer crop species:

Common Name	Scientific Name	Rate (fl ozs/A)
Loblolly pine	<i>Pinus taeda</i>	24 to 40
Loblolly X pitch hybrid		
Longleaf pine	<i>Pinus palustris</i>	
Shortleaf pine	<i>Pinus echinata</i>	
Virginia pine	<i>Pinus virginiana</i>	20 to 32
Slash pine	<i>Pinus elliottii</i>	
Coastal redwood	<i>Sequoia sempervirens</i>	12 to 24
Douglas fir	<i>Pseudotsuga menziesii</i>	
Western hemlock	<i>Tsuga heterophylla</i>	
California red fir	<i>Abies magnifica</i>	12 to 20
California white fir	<i>Abies concolor</i>	
Jack pine	<i>Pinus banksiana</i>	12 to 16
Lodgepole pine	<i>Pinus contorta</i>	
Pitch pine	<i>Pinus rigida</i>	
Ponderosa pine	<i>Pinus ponderosa</i>	
Sugar pine	<i>Pinus lambertiana</i>	
White pine	<i>Pinus strobus</i>	
Black spruce	<i>Picea mariana</i>	
Red spruce	<i>Picea rubens</i>	
White spruce	<i>Picea glauca</i>	

Use the label rate of **Arsenal herbicide Applicators Concentrate** per acre applied as a broadcast foliar spray for long-term control of labeled woody plants and residual control of herbaceous weeds. Within 4 to 6 weeks of treatment, grass and other herbaceous weeds will be controlled and may provide fuel to facilitate a site preparation burn, if desired, to control conifers or other species tolerant to the herbicide.

Apply the label rate of **Arsenal herbicide Applicators Concentrate** per acre in 5 to 30 gallons total spray solution for helicopter applications or 5 to 100 gallons total spray solution for mechanical ground spray and backpack applications. Use a minimum of 1/2 percent by volume nonionic surfactant (NIS). Use the higher label rates of **Arsenal herbicide Applicators Concentrate** and higher spray volumes when controlling particularly dense or multilayered canopies of hardwood stands, or difficult-to-control species.

In certain cases, tank mixes may be necessary for chemical control of conifers and other species tolerant to **Arsenal herbicide Applicators Concentrate**. Observe all precautions and restrictions on the product labels. Always follow the most restrictive label. Combinations with other products labeled for forest site preparation may kill certain plants such as legumes and blackberry, which are desirable for wildlife habitat.

Where quick initial brownout (deadening of foliage) is desired for burning, apply a tank mixture of 16 fl ozs to 32 fl ozs **Arsenal® herbicide Applicators Concentrate** with 16 ozs to 64 ozs glyphosate or 16 ozs to 48 ozs triclopyr ester per acre. For control of seedling pines, apply 16 fl ozs to 32 fl ozs **Arsenal herbicide Applicators Concentrate** with 3 to 4 quarts glyphosate. For site preparation, rates less than 24 fl ozs **Arsenal herbicide Applicators Concentrate** will provide suppression of hardwood brush and trees; some resprouting may occur.

DO NOT plant seedlings of black spruce (*Picea mariana*) or white spruce (*Picea glauca*) on sites that have been broadcast-treated with **Arsenal herbicide Applicators Concentrate** or into the treated zone of spot or banded applications for three months following application or injury may occur.

Herbaceous Weed Control

Use **Arsenal herbicide Applicators Concentrate** for selective weeding in the following conifers:

Common Name	Scientific Name	Rate (fl ozs/A)
Loblolly pine	<i>Pinus taeda</i>	6 to 10
Loblolly X pitch hybrid		
Virginia pine	<i>Pinus virginiana</i>	
Longleaf pine ¹	<i>Pinus palustris</i>	4 to 6
Slash pine ¹	<i>Pinus elliottii</i>	
Douglas fir ¹	<i>Pseudotsuga menziesii</i>	

¹ Use of surfactant is not recommended.

Arsenal herbicide Applicators Concentrate may be applied as a broadcast treatment, banded over tree rows, or as a directed spray for release of young conifers from herbaceous weeds. To prevent possibility of conifer injury, **DO NOT** apply **Arsenal herbicide Applicators Concentrate** when conifers are under stress from drought, disease, animal or winter injury, planting shock, or other stresses reducing conifer vigor. Broadcast applications may be made by helicopter, ground, or backpack sprayer. For difficult-to-control weeds, use the higher labeled rates. Where herbaceous weeds have overtopped conifer seedlings, a nonionic surfactant may be added to improve weed control (except for slash pine, long-leaf pine, and Douglas fir), at a rate not to exceed 1/4 percent of spray solution volume. Some minor conifer growth inhibition may be observed when herbaceous weed control treatments are made during periods of active conifer growth.

Arsenal herbicide Applicators Concentrate may also be applied using backpack or handheld sprayers to control herbaceous weeds around individual conifer seedlings. Mix 0.4 fl oz to 0.6 fl oz **Arsenal herbicide Applicators Concentrate** and 0.2 oz nonionic surfactant per gallon of water. Direct the spray to the weeds and minimize the amount applied to conifer foliage for best conifer tolerance. Ensure that maximum labeled rates per acre for previously listed crop species are not exceeded.

Arsenal herbicide Applicators Concentrate may be tank mixed with sulfometuron to broaden the spectrum of weeds controlled. For loblolly pine, apply 4 fl ozs to 6 fl ozs **Arsenal herbicide Applicators Concentrate** plus 1 oz to 2 ozs sulfometuron per acre. The application of **Arsenal herbicide Applicators Concentrate** plus sulfometuron on other conifer species may cause growth suppression.

Conifer Release Treatment

Arsenal herbicide Applicators Concentrate may be applied as a broadcast or directed spray application for suppression of labeled brush, tree, and herbaceous weed species. Directed spray applications may be made with low-volume applications in conifer stands of all ages by targeting the unwanted vegetation and avoiding direct application to the conifer. Ensure that maximum labeled rates per acre listed for the following crop species are not exceeded.

Broadcast Applications for release of the following conifers from hardwood competition:

Common Name	Scientific Name	Rate (fl ozs/A)
Loblolly pine ²	<i>Pinus taeda</i>	12 to 20
Loblolly X pitch hybrid ²		
Virginia pine ²	<i>Pinus virginiana</i>	
Atlantic white cedar ¹	<i>Chamaecyparis thyoides</i>	12 to 16
Longleaf pine	<i>Pinus palustris</i>	
Pitch pine	<i>Pinus rigida</i>	
Shortleaf pine	<i>Pinus echinata</i>	
Slash pine	<i>Pinus elliottii</i>	8 to 16
White pine ¹	<i>Pinus strobus</i>	
California red fir	<i>Abies magnifica</i>	8 to 12
California white fir	<i>Abies concolor</i>	
Lodgepole pine ²	<i>Pinus contorta</i>	
Douglas fir ²	<i>Pseudotsuga menziesii</i>	6 to 12
Jack pine ²	<i>Pinus banksiana</i>	
Black spruce ²	<i>Picea mariana</i>	
Red spruce ²	<i>Picea rubens</i>	
White spruce ²	<i>Picea glauca</i>	

¹ **DO NOT** make applications to white pine stands younger than three years old. To minimize potential white pine injury, release treatments should not be made prior to July 15.

² Applications should be made after formation of final conifer resting buds in the fall or height growth inhibition may occur.

³ **Mid-rotation release:** For broadcast applications below the pine canopy in established stands of loblolly pine, loblolly X pitch hybrid, and Virginia pine, use 16 fl ozs to 32 fl ozs product per acre. For mid-rotation release of other species, use rates listed in chart above.

⁴ Apply **Arsenal herbicide Applicators Concentrate** after July 15 and before hardwood defoliation in the fall. The use of rates below 16 ozs/A are intended for hardwood growth suppression and some hardwood resprouting should be expected.

For slash pine and longleaf pine, broadcast release treatments over the top of pines for the purpose of woody plant control must be made after August 15 and only in stands 2 through 5 years old. For applications over the top of slash pine and longleaf pine, DO NOT add surfactant and use lower labeled rates on sandy soils.

Apply the label rate of **Arsenal® herbicide Applicators Concentrate** per acre when making broadcast applications with helicopter or ground spray equipment. Refer to mixing and application instructions for proper spray volumes. A nonionic surfactant may be added at no more than 1/4 percent by volume.

Use the higher label rates of **Arsenal herbicide Applicators Concentrate** when controlling particularly dense stands or difficult-to-control species.

Some minor conifer growth inhibition may be observed when release treatments are made during periods of active conifer growth. To minimize potential conifer height growth inhibition, **DO NOT** make broadcast applications to conifer stands except loblolly pine before the end of the second growing season. To minimize potential conifer height growth inhibition, broadcast release treatments may be made late in the growing season. To prevent possibility of conifer injury, **DO NOT** apply **Arsenal herbicide Applicators Concentrate** when conifers are under stress from drought, disease, animal or winter injury, or other stresses reducing conifer vigor.

Arsenal herbicide Applicators Concentrate may be used to release loblolly pine seedlings during the first growing season following planting or for one-year-old natural loblolly pine regeneration. For one-year-old loblolly pine release, apply 12 fl ozs to 20 fl ozs/A of **Arsenal herbicide Applicators Concentrate** after July 15. Rates below 16 fl ozs/A are intended for hardwood growth suppression; some hardwood resprouting should be expected.

Spot Treatment of Undesirable Hardwood Vegetation

Arsenal herbicide Applicators Concentrate may be used as a directed foliar or cut-stem application to control undesirable brush and hardwoods in the management of stands of all ages for the conifer species listed in the broadcast application section above. Refer to mixing and application instructions in the directed foliar or cut-stem sections above for proper use rates, equipment, and application techniques. **DO NOT** exceed maximum labeled rates per acre listed for crop species. Cut-stem applications may be used for spot treatment of undesirable hardwoods in Ponderosa pine stands using 12 fl ozs or less of product per acre.

Avoid direct application to desired plant species or injury may occur. Injury may occur to nontarget or desirable hardwoods or conifers if they extend from the same root system, or their root systems are grafted to those of the treated tree, or their roots extend into the treated zone.

Late Rotation Vegetation Control in Western Conifer

In California, the Pacific Northwest and Inland Northwest, broadcast aerial applications of **Arsenal herbicide Applicators Concentrate** up to 24 fl ozs/A are permissible in conifer stands that are targeted for harvesting the year following treatment. Use minimum spray volume of 15 gallons per acre. Significant conifer injury or mortality must be expected. **DO NOT** use this treatment if conifer injury or mortality cannot be tolerated.

Bag and Spray Application for Conifer Release

In Douglas fir and Ponderosa pine stands, broadcast applications of **Arsenal herbicide Applicators Concentrate** up to 16 fl ozs/A are permissible when the trees are covered by bags prior to the application. The bags must prevent the spray mix from contacting the conifer foliage. On sites with coarse textured soils (e.g. decomposed granite, pumice, sandy or rocky sites) or low levels of soil organic matter (generally 5% or less), significant conifer growth inhibition and mortality is possible. **DO NOT** use this treatment on these types of sites if conifer growth inhibition and mortality cannot be tolerated.

Nonagricultural Land Use

Arsenal herbicide Applicators Concentrate may be used for woody and herbaceous weed control in nonagricultural lands including private, public and military lands as follows: uncultivated nonagricultural areas (including airports, highway, railroad and utility rights-of-way, sewage disposal areas, etc.); uncultivated agricultural areas - noncrop producing (including farmyards, fuel storage areas, fence rows, nonirrigation ditch-banks, barrier strips, etc.); industrial sites - outdoor (including lumberyards, pipeline and tank farms, etc.); and natural areas (including wildlife management areas, wildlife openings, wildlife habitats, recreation areas, campgrounds, trailheads, and trails).

Applications to nonagricultural lands are not applicable to treatment of commercial timber or other plants being grown for sale or other commercial use, or for commercial seed production, or for research purposes.

Brush Control

Use the specified rate of **Arsenal herbicide Applicators Concentrate** with the preferred application technique for the control of undesirable brush.

Tank Mixes and Application Rates for Low-volume Foliar Brush Control*

Target Vegetation	Arsenal herbicide Applicators Concentrate Rate (by volume)	Tank Mix
Mixed hardwoods without elm, locust, or pine	0.50 to 0.75%	Surfactant
Mixed hardwoods containing elm, locust, and pine	0.25 to 0.50%	Accord® at 2% to 3% by volume plus surfactant
Mixed hardwoods with locust and pine but no elm	0.25 to 0.50%	Krenite® at 2% to 5% by volume plus surfactant
Mixed hardwoods with locust and elm but no pine	0.25 to 0.50%	Escort® at 2 ozs/A or 2.3 grams/gal plus surfactant

* Tank mixes with 2,4-D or products containing 2,4-D have resulted in reduced **Arsenal herbicide Applicators Concentrate** efficacy.

Backpack and Handheld Spray Mixing Guide

% Solution	Product per gallon of mix (fl ozs)	Product per 4-gallon backpack (fl ozs)
0.25%	0.3	1.3
0.5%	0.6	2.6
1.0%	1.3	5.1
2.0%	2.6	10.2
3.0%	3.8	15.4
5.0%	6.4	25.6

Measuring Chart

128 ounces	=	1 gallon
16 ounces	=	1 pint
8 pints	=	1 gallon
4 quarts	=	1 gallon
2 pints	=	1 quart

Selective Control of Undesirable Weeds in Unimproved Bermudagrass and Bahiagrass

Arsenal® herbicide Applicators Concentrate may be used on unimproved Bermudagrass and Bahiagrass turf such as roadsides, utility rights-of-way, and other nonagricultural lands. The application of **Arsenal herbicide Applicators Concentrate** on established common and coastal Bermudagrass and Bahiagrass provides control of labeled broadleaf and grass weeds. Competition from these weeds is eliminated, releasing the Bermudagrass and Bahiagrass. Treatment of Bermudagrass with **Arsenal herbicide Applicators Concentrate** results in a compacted growth habit and seedhead inhibition.

Uniformly apply with properly calibrated ground equipment using at least 10 gallons of water per acre.

Temporary yellowing of grass may occur when treatment is made after growth commences.

Restrictions

- **DO NOT** add surfactant in excess of the specified rate (1 fl oz per 25 gallons of spray solution).
- **DO NOT** apply to grass during its first growing season.
- **DO NOT** apply to grass that is under stress from drought, disease, insects, or other causes.

Dosage Rate and Timing

Bermudagrass. Apply **Arsenal herbicide Applicators Concentrate** at 3 fl ozs to 6 fl ozs per acre when the Bermudagrass is dormant. Apply **Arsenal herbicide Applicators Concentrate** at 3 fl ozs to 4 fl ozs per acre after the Bermudagrass has reached full greenup. Applications made during greenup will delay greenup. Include a surfactant in the spray solution.

For additional preemergence control of annual grass and small-seeded broadleaf weeds, add **Pendulum® AquaCap™ herbicide** at the rate of 3.1 to 6.3 pints per acre. Consult the **Pendulum AquaCap** label for weeds controlled and for other use directions and precautions.

For control of Johnsongrass in Bermudagrass turf, apply **Arsenal herbicide Applicators Concentrate** at 4 fl ozs per acre, plus **Roundup® herbicide** at 12 ozs per acre, plus surfactant. For additional control of broadleaves and vines, **Garlon® 3A herbicide** may be added to the above mix at the rate of 1 to 2 pints per acre. Observe all precautions and restrictions on the **Garlon 3A** and **Roundup** labels.

Bahiagrass. Apply **Arsenal herbicide Applicators Concentrate** at 2 fl ozs to 4 fl ozs per acre when the Bahiagrass is dormant or after the grass has initiated greenup but has not exceeded 25% greenup. Include a surfactant in the spray solution (see **Adjuvants** section for specific use directions for surfactants).

Weeds Controlled in Unimproved Bermudagrass and Bahiagrass

Common Name	Scientific Name
Bedstraw*	<i>Galium</i> spp.
Bishopweed*	<i>Ptilimnium capillaceum</i>
Buttercup*	<i>Ranunculus parviflorus</i>
Carolina geranium	<i>Geranium carolinianum</i>
Fescue	<i>Festuca</i> spp.
Foxtail	<i>Setaria</i> spp.
Little barley	<i>Hordeum pusillum</i>
Seedling Johnsongrass	<i>Sorghum halepense</i>
White clover	<i>Trifolium repens</i>
Wild carrot	<i>Daucus carota</i>
Yellow woodsorrel	<i>Oxalis stricta</i>

* Use not permitted in California unless otherwise directed by supplemental labeling.

Grass Growth and Seedhead Suppression

Arsenal herbicide Applicators Concentrate may be used to suppress growth and seedhead development of certain turfgrass in unimproved areas. When **Arsenal herbicide Applicators Concentrate** is applied to desirable turf, it may result in temporary turf damage and/or discoloration. Effects to the desirable turf may vary with environmental conditions. For optimum performance, application should be made prior to culm elongation. Applications may be made before or after mowing. If applied prior to mowing, allow at least 3 days of active growth before mowing. If applied following a mowing, allow sufficient time for the grasses to recover before applying this product or injury may be amplified.

DO NOT APPLY to turf under stress (drought, cold, insect damage, etc.) or severe injury or death may occur.

Bermudagrass. Apply **Arsenal herbicide Applicators Concentrate** at 3 fl ozs to 4 fl ozs per acre from early greenup to prior to seedhead initiation. **DO NOT** add a surfactant for this application.

Cool-season Unimproved Turf. Apply **Arsenal herbicide Applicators Concentrate** at 1 fl oz per acre plus 0.25% nonionic surfactant. For increased suppression, **Arsenal herbicide Applicators Concentrate** may be tank mixed with such products as **Campaign® herbicide** (24 ozs per acre) or **Embark® growth regulator** (8 ozs per acre). Tank mixes may increase injury to desired turf. Consult each product label for labeled turf species and other use directions and precautions. Tank mixes with 2,4-D or products containing 2,4-D may decrease the effectiveness of **Arsenal herbicide Applicators Concentrate**.

Total Vegetation Control where Bare Ground is Desired

Arsenal herbicide Applicators Concentrate is an effective herbicide for preemergence or postemergence control of many annual and perennial broadleaf and grass weeds where bare ground is desired. **Arsenal herbicide Applicators Concentrate** is particularly effective on hard-to-control perennial grasses. **Arsenal herbicide Applicators Concentrate** at 0.75 to 3 pints per acre can be used alone or in tank mix with herbicides approved for use in bare ground. The degree and duration of control are dependent on the rate of **Arsenal herbicide Applicators Concentrate** used, tank mix partner, the volume of carrier, soil texture, rainfall, and other conditions.

Consult manufacturer's labels for specific rates and weeds controlled. Always follow the more restrictive label restrictions and precautions for all products used when making an application involving tank mixes.

Applications of **Arsenal® herbicide Applicators Concentrate** may be made any time of the year. Use equipment calibrated to deliver desired gallons per acre spray volume and uniformly distribute the spray pattern over the treated area.

Postemergence Application. Always use a spray adjuvant (see **Adjuvants** section of this label) when making a postemergence application. For optimum performance on tough-to-control annual grass weeds, apply at a total volume of 100 gallons per acre or less. For quicker burndown or brownout of target weeds, **Arsenal herbicide Applicators Concentrate** may be tank mixed with **Roundup® herbicide**. Tank mixes with 2,4-D or products containing 2,4-D may reduce the performance of **Arsenal herbicide Applicators Concentrate**. Always follow the more restrictive label restrictions and precautions for all products used when tank mixing.

Spot Treatment. Arsenal herbicide Applicators Concentrate may be used as a follow-up treatment to control escapes or weed encroachment in a bareground situation. To prepare the spray solution, thoroughly mix in each gallon of water 0.25% to 2.5% **Arsenal herbicide Applicators Concentrate** plus an adjuvant. For increased burndown, include **Roundup** as a tank mixture. For added residual weed control or to increase the weed spectrum, add **Pendulum® AquaCap™ herbicide**, **Overdrive® herbicide**, or diuron. Always follow the more restrictive label restrictions and precautions for all products used when tank mixing.

Control of Undesirable Weeds under Paved Surfaces

Arsenal herbicide Applicators Concentrate can be used under asphalt, pond liners and other paved areas, **ONLY** in industrial sites or where the pavement has a suitable barrier along the perimeter that prevents encroachment of roots of desirable plants.

Use **Arsenal herbicide Applicators Concentrate** only where the area to be treated has been prepared according to good construction practices. If rhizomes, stolons, tubers or other vegetative plant parts are present in the site, remove them by scalping with a grader blade to a depth sufficient to ensure their complete removal.

Follow **Arsenal herbicide Applicators Concentrate** applications with paving as soon as possible. **DO NOT** apply where the chemical may contact the roots of desirable trees or other plants.

This product is not to be used under pavement on residential properties, such as driveways or parking lots, or for use in recreational areas, such as under bike or jogging paths, golf cart paths, or tennis courts, or where landscape plantings could be anticipated.

Injury or death of desirable plants may result if this product is applied where roots are present or where roots may extend into the treated area. Roots of trees and shrubs may extend a considerable distance beyond the branch extremities (drip line).

Apply to the soil surface only when final grade is established. **DO NOT** move soil following **Arsenal herbicide Applicators Concentrate** application.

Apply **Arsenal herbicide Applicators Concentrate** in sufficient water (at least 100 gals per acre) to ensure thorough and uniform wetting of the soil surface, including the shoulder areas. Add **Arsenal herbicide Applicators Concentrate** at a rate of 3 pints per acre (1.1 fluid ounces per 1000 square feet) to clean water in the spray tank during the filling operation. Agitate before spraying.

If the soil is not moist prior to treatment, incorporation of **Arsenal herbicide Applicators Concentrate** is needed for herbicide activation. Incorporate **Arsenal herbicide Applicators Concentrate** into the soil to a depth of 4 to 6 inches using a rototiller or disc. Rainfall or irrigation of 1 inch will also provide uniform incorporation. **DO NOT** allow treated soil to wash or move into untreated areas.

Spot Treatment and Crack-and-crevice Treatment

Use **Arsenal herbicide Applicators Concentrate** as an initial or follow-up treatment to control weed escapes or weed encroachment in a bare-ground situation, including cracks and crevices in paved surfaces such as roadways, runways, and parking areas.

Grass Pasture and Rangeland Spot Treatment Weed Control

For the control of undesirable vegetation in grass pasture and rangeland, **Arsenal herbicide Applicators Concentrate** may be applied as a spot treatment at a rate of 1 to 24 fluid ounces of product per treated acre using any of the described ground application methods. Spot applications to grass pasture and rangeland may not exceed more than 1/10 of the area to be grazed or cut for hay. See appropriate sections of this label for specific use directions for the application method and vegetation control desired. **DO NOT** apply more than 24 fluid ounces per acre per year.

Grazing and Haying Restrictions

- There are no grazing restrictions following **Arsenal herbicide Applicators Concentrate** application.
- **DO NOT** cut forage grass for hay for 7 days after **Arsenal herbicide Applicators Concentrate** application.

Rangeland Use Instructions

Arsenal herbicide Applicators Concentrate may be applied to rangeland for the control of undesirable vegetation to achieve one or more of the following vegetation management objectives:

- Control of undesirable (nonnative, invasive and noxious) plant species
- Control of undesirable vegetation to aid in the establishment of desirable rangeland plant species
- Control of undesirable vegetation to aid in the establishment of desirable rangeland vegetation following a fire
- Control of undesirable vegetation to reduce wildfire fuel
- Release of existing desirable rangeland plant communities from the competitive pressure of undesirable plant species
- Control of undesirable vegetation for wildlife habitat improvement

To ensure the protection of threatened and endangered plants when applying **Arsenal herbicide Applicators Concentrate** to rangeland:

- Federal agencies must follow NEPA regulations to ensure protection of threatened and endangered plants.
- State agencies must work with the Fish and Wildlife Service or the Service's designated state conservation agency to ensure protection of threatened and endangered plants.
- Other organizations or individuals must operate under a habitat conservation plan if threatened or endangered plants are known to be present on the land to be treated.

See the appropriate section(s) of this label for specific use directions for the desired rangeland vegetation management objective.

Arsenal herbicide Applicators Concentrate must only be applied to a given rangeland acre as specific weed problems arise. Long-term control of undesirable weed species ultimately depends on the successful use of land management practices that promote the growth and sustainability of desirable rangeland plant species.

Rotational Crop Instructions

Rotational crops may be planted 12 months after applying **Arsenal® herbicide Applicators Concentrate** at the specified pasture and rangeland rate. Following 12 months after an **Arsenal herbicide Applicators Concentrate** application and before planting any crop, a successful field bioassay must be completed. The field bioassay consists of a test strip of the intended rotational crop planted in the previously treated area in the grass pasture/rangeland and grown to maturity. The test strip should include low areas and knolls and include variations in soil type and pH within the treated area. If no crop injury is evident in the test strip, the intended rotational crop may be planted the following year.

Use of **Arsenal herbicide Applicators Concentrate** in accordance with label directions is expected to result in normal growth of rotational crops in most situations; however, various environmental and agronomic factors make it impossible to eliminate all risks associated with the use of this product and, therefore, rotational crop injury is always possible.

Aquatic Weed Control

Arsenal herbicide Applicators Concentrate may be applied for the control of floating and emergent undesirable vegetation (see the **Aquatic Weeds Controlled** and the **Terrestrial Weeds Controlled** section) in or near bodies of water that may be flowing, nonflowing, or transient. **Arsenal herbicide Applicators Concentrate** may be applied to aquatic sites that include lakes, rivers, streams, ponds, seeps, drainage ditches, canals, reservoirs, swamps, bogs, marshes, estuaries, bays, brackish water, transitional areas between terrestrial and aquatic sites, riparian sites, and seasonal wet areas. See **Product Use Precautions and Restrictions** section of this label for precautions, restrictions, and instructions on aquatic uses.

Read and observe the following directions if aquatic sites are present in nonagricultural lands and are part of the intended treatment area.

Arsenal herbicide Applicators Concentrate must be applied to the emergent foliage of the target vegetation and has little-to-no activity on submerged aquatic vegetation. **Arsenal herbicide Applicators Concentrate** concentrations resulting from direct application to water are not expected to be of sufficient concentration nor duration to provide control of target vegetation. Application should be made in such a way as to maximize spray interception by the target vegetation while minimizing the amount of overspray that enters the water.

Arsenal herbicide Applicators Concentrate does not control plants that are completely submerged or have a majority of their foliage under water.

Arsenal herbicide Applicators Concentrate may be applied with surface or helicopter application equipment in a minimum of 2 gallons of water per acre. When applying by helicopter, follow directions under the **Aerial Application** section of this label; otherwise, refer to the **Ground Application** section when using surface equipment.

Applications to moving bodies of water should be made while traveling upstream to prevent concentration of this herbicide in water. **DO NOT** apply to bodies of water or portions of bodies of water where emergent and/or floating weeds do not exist.

When application is to be made to target vegetation that covers a large percentage of the surface area of impounded water, treating the area in strips may avoid oxygen depletion due to decaying vegetation. Oxygen depletion may result in the suffocation of some sensitive aquatic organisms. If oxygen depletion is a concern, treat no more than 1/2 of the surface area of the water in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow aquatic organisms to move into untreated areas.

Avoid washoff of sprayed foliage by spray boat or recreational boat backwash for 1 hour after application.

Apply **Arsenal herbicide Applicators Concentrate** at 1 to 3 pints per acre depending on species present and weed density. **DO NOT** exceed the maximum label rate of 3 pints per acre (1.5 lbs ae/A) per year. Use the higher labeled rates for heavy weed pressure. Consult the **Aquatic Weeds Controlled** section and the **Terrestrial Weeds Controlled** section of this label for specific rates.

Arsenal herbicide Applicators Concentrate may be applied as a draw-down treatment in areas described above. Apply **Arsenal herbicide Applicators Concentrate** to weeds after water has been drained and allow 14 days before reintroduction of water.

Permitting - Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.

Private waters - Applications may be made to private waters that are still, such as ponds, lakes, and drainage ditches where there is minimal or no outflow to public waters.

In New York state, a permit is required for application to private water bodies.

Weeds Controlled

Aquatic Weeds Controlled

Arsenal herbicide Applicators Concentrate will control the following target species as specified in the **Use Rates and Application Directions** column of the table. Rates are expressed in terms of product volume for broadcast applications and as a % solution for directed applications including spot treatments. **For % solution applications, DO NOT apply more than the equivalent of 3 pints of Arsenal herbicide Applicators Concentrate per acre.**

Common Name	Scientific Name	Use Rates and Application Directions
Floating		
*Floating heart	<i>Nymphodes</i> spp.	1 to 2 pints/A (0.25 to 0.50% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Frogbit	<i>Limnobium spongia</i>	0.5 to 1.0 pint/A (0.25% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Spatterdock	<i>Nuphar luteum</i>	Apply a tank mix of 1 to 2 pints/A Arsenal herbicide Applicators Concentrate + 4 to 6 pints/A glyphosate (0.25% Arsenal herbicide Applicators Concentrate + 1.5% glyphosate) in 100 GPA water for best control. Ensure 100% coverage of actively growing emergent foliage.
*Water hyacinth	<i>Eichhornia crassipes</i>	0.5 to 1.0 pint/A (0.25% solution) applied in 100 GPA water to actively growing foliage.
*Water lettuce	<i>Pistia stratiotes</i>	0.5 to 1.0 pint/A (0.25% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.

* Use not permitted in California unless otherwise directed by supplemental labeling.

(continued)

Aquatic Weeds Controlled *(continued)*

Common Name	Scientific Name	Use Rates and Application Directions
Emerged		
*Alligatorweed	<i>Alternanthera philoxeroides</i>	0.5 to 2.0 pints/A (0.25% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Arrowhead, duck-potato	<i>Sagittaria</i> spp.	0.5 to 1.0 pint/A (0.25% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Bacopa, lemon	<i>Bacopa</i> spp.	0.5 to 1.0 pint/A (0.25% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Parrot feather	<i>Myriophyllum aquaticum</i>	Must be foliage above water for sufficient Arsenal® herbicide Applicators Concentrate uptake. Apply 1 to 2 pints/A to actively growing emergent foliage.
*Pennywort	<i>Hydrocotyle</i> spp.	0.5 to 1.0 pint/A (0.25% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Pickerelweed	<i>Pontederia cordata</i>	1.0 to 1.5 pints/A (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Taro, wild Dasheen Elephant's ear Coco yam	<i>Colocasia esculentum</i>	2 to 3 pints/A (0.75% solution) applied in 100 GPA with a high quality sticker adjuvant. Ensure good coverage of actively growing emergent foliage.
*Water chestnut	<i>Trapa natans</i>	2 to 3 pints/A (0.75% solution) applied in 100 GPA with a high quality sticker adjuvant. Ensure good coverage of actively growing emergent foliage.
*Water lily	<i>Nymphaea odorata</i>	1.0 to 1.5 pints/A (0.5% solution) applied in 100 GPA water mix. Ensure 100% coverage of actively growing emergent foliage.
*Water primrose	<i>Ludwigia uruguayensis</i>	2 to 3 pints/A (0.75% solution). Ensure 100% coverage of actively growing emergent foliage.
Terrestrial/Marginal		
*Soda apple, Aquatic nightshade	<i>Solanum tampicense</i>	1 pint/A applied to foliage
*Bamboo, Japanese	<i>Phyllostachys</i> spp.	1.5 to 2.0 pints/A applied to the foliage when plant is actively growing; before setting seedhead. More foliage will result in greater herbicide uptake, resulting in greater root kill.
Beach, vitex	<i>Vitex rotundifolia</i>	2.5% solution + 1% MSO foliar spray. 8.5% solution stem injection (hack and squirt)
Brazilian pepper Christmasberry	<i>Schinus terebinthifolius</i>	1 to 2 pints/A applied to foliage
Cattail	<i>Typha</i> spp.	1 to 2 pints/A (0.5% solution) applied to actively growing green foliage after full leaf elongation. Lower rates will control cattail in the North; higher rates are needed in the South.
Chinese tallow tree	<i>Sapium sebiferum</i>	8 to 12 fl ozs/A applied to foliage
Cogongrass	<i>Imperata cylindrica</i>	Burn foliage, till area; then fall-spray 1 quart/A Arsenal herbicide Applicators Concentrate + MSO applied to new growth.
Cordgrass, prairie	<i>Spartina</i> spp.	2 to 3 pints/A applied to actively growing foliage
*Cutgrass	<i>Zizaniopsis miliacea</i>	2 to 3 pints/A applied to actively growing foliage
*Elephant grass Napier grass	<i>Pennisetum purpureum</i>	1.5 pints/A applied to actively growing foliage
*Flowering rush	<i>Butomus umbellatus</i> L.	1.0 to 1.5 pints/A applied to actively growing foliage
Giant reed Wild cane	<i>Arundo donax</i>	2 to 3 pints/A applied in spring to actively growing foliage

*Use not permitted in California unless otherwise directed by supplemental labeling.

(continued)

Aquatic Weeds Controlled *(continued)*

Common Name	Scientific Name	Use Rates and Application Directions
Terrestrial/Marginal <i>(continued)</i>		
*Golden bamboo	<i>Phyllostachys aurea</i>	1.5 to 2.0 pints/A applied to foliage when plant is actively growing; before setting seedhead. More foliage will result in greater herbicide uptake, resulting in greater root kill.
Junglerice	<i>Echinochloa colonum</i>	1.5 to 2.0 pints/A applied to actively growing foliage
Knapweed	<i>Centaurea</i> spp.	Russian knapweed: 1.0 to 1.5 pints + 1 quart/A MSO fall-applied after senescence begins
Knotweed, Japanese	<i>Polygonum cuspidatum</i> <i>Fallopia japonica</i>	1.5 to 2.0 pints/A applied postemergence to actively growing foliage
Melaleuca Paperbark tree	<i>Melaleuca quinquenervia</i>	For established stands , apply 3 pints/A Arsenal® herbicide Applicators Concentrate + 6 pints/A glyphosate + spray adjuvant. For best results, use 4 quarts/A methylated seed oil as an adjuvant. For ground foliar application , uniformly apply to ensure 100% coverage. For broadcast foliar control , apply aerially in a minimum of 2 passes at 10 gallons/A applied cross treatment. For spot treatment , use a 12.5% Arsenal herbicide Applicators Concentrate + 25% solution of glyphosate + 1.25% MSO in water applied as a fill or stump treatment.
*Nutmass Kili'p'opu	<i>Cyperus rotundus</i>	1 pint Arsenal herbicide Applicators Concentrate + 1 quart/A MSO applied early postemergence
*Nutsedge	<i>Cyperus</i> spp.	1.0 to 1.5 pints postemergence to foliage or preemergence incorporated, nonincorporated, preemergence applications will not control.
Phragmites Common reed	<i>Phragmites australis</i>	2 to 3 pints/A applied to actively growing green foliage after full leaf elongation. Ensure 100% coverage. If stand has a substantial amount of old stem tissue, mow or burn, allow to regrow to approximately 5 feet tall before treatment. Lower rates will control phragmites in the North; higher rates are needed in the South.
*Poison hemlock	<i>Conium maculatum</i>	1 pint Arsenal herbicide Applicators Concentrate + 1 quart/A MSO applied preemergence to early postemergence to rosette prior to flowering
Purple loosestrife	<i>Lythrum salicaria</i>	0.5 pint/A applied to actively growing foliage
Reed canarygrass	<i>Phalaris arundinacea</i>	1.5 to 2.0 pints/A applied to actively growing foliage
Rose, swamp	<i>Rosa palustris</i>	1.0 to 1.5 pints/A applied to actively growing foliage
Russian olive	<i>Elaeagnus angustifolia</i>	1 to 2 pints/A or a 0.5% solution applied to foliage
Saltcedar Tamarisk	<i>Tamarix</i> spp.	Aerial apply 1 quart Arsenal herbicide Applicators Concentrate + 0.25% v/v NIS to actively growing foliage during flowering. For spot spraying, use 0.5% solution of Arsenal herbicide Applicators Concentrate + 0.25% v/v NIS and spray to wet foliage. After application, wait at least 2 years before disturbing treated saltcedar. Earlier disturbance can reduce overall control.
Smartweed	<i>Polygonum</i> spp.	1 pint/A applied early postemergence
Sumac	<i>Rhus</i> spp.	1.0 to 1.5 pints/A applied to foliage
Swamp morningglory Water spinach Kangkong	<i>Ipomoea aquatica</i>	0.5 to 1.0 pint/A Arsenal herbicide Applicators Concentrate + 1 quart/A MSO applied early postemergence
Torpedo grass	<i>Panicum repens</i>	2 pints/A (0.50 to 0.75% solution); ensure good coverage to actively growing foliage
*White top Hoary cress	<i>Cardaria draba</i>	0.5 to 1.0 pint/A applied in spring to foliage during flowering
Willow	<i>Salix</i> spp.	1.0 to 1.5 pints/A Arsenal herbicide Applicators Concentrate applied to actively growing foliage. Ensure good coverage

*Use not permitted in California unless otherwise directed by supplemental labeling.

Terrestrial Weed Control

In terrestrial sites, **Arsenal® herbicide Applicators Concentrate** will provide preemergence or postemergence control with residual control of the following target vegetation species at the rates listed. Residual control refers to control of newly germinating seedlings in both annuals and perennials. In general, annual weeds may be controlled by preemergence or postemergence applications of **Arsenal herbicide Applicators Concentrate**. For established biennials and perennials, postemergence applications of **Arsenal herbicide Applicators Concentrate** will provide the best control.

The rates shown below pertain to broadcast applications and indicate the relative sensitivity of these weeds. The relative sensitivity should be referenced when preparing low-volume spray solutions (see **Low-volume Foliar Application** section of **Ground Application**); low-volume applications may provide control of the target species with less **Arsenal herbicide Applicators Concentrate** per acre than is shown for the broadcast treatments. Use **Arsenal herbicide Applicators Concentrate** only in accordance with the specific use directions on this label and the leaflet label.

The relative sensitivity of the species listed following can also be used to determine the relative risk of causing nontarget plant injury if any of the species listed following are considered to be desirable within the area to be treated.

Resistant Biotypes. Naturally occurring biotypes (a plant within a given species that has a slightly different but distinct genetic makeup from other plants of the same species) of some weeds listed on this label may not be effectively controlled. If naturally occurring, resistant biotypes are present in an area, **Arsenal herbicide Applicators Concentrate** should be tank mixed or applied sequentially with an appropriate registered herbicide having a different mode of action to ensure control.

Grass Weeds

Common Name	Scientific Name	Growth Habit ²
Apply 1.0 to 1.5 pts/A¹		
Annual bluegrass	<i>Poa annua</i>	A
Broadleaf signalgrass	<i>Brachiaria platyphylla</i>	A
Canada bluegrass	<i>Poa compressa</i>	P
Downy brome	<i>Bromus tectorum</i>	A
Fescue	<i>Festuca</i> spp.	A/P
Foxtail	<i>Setaria</i> spp.	A
Italian ryegrass	<i>Lolium multiflorum</i>	A
Johnsongrass ⁴	<i>Sorghum halepense</i>	P
Kentucky bluegrass	<i>Poa pratensis</i>	P
Napier grass ⁵	<i>Pennisetum purpureum</i>	P
Orchardgrass	<i>Dactylis glomerata</i>	P
Paragrass	<i>Brachiaria mutica</i>	P
Quackgrass	<i>Agropyron repens</i>	P
Sandbur	<i>Cenchrus</i> spp.	A
Smooth brome	<i>Bromus inermis</i>	P
Vaseygrass	<i>Paspalum urvillei</i>	P
Wild oats	<i>Avena fatua</i>	A
Witchgrass	<i>Panicum capillare</i>	A

(continued)

Grass Weeds (continued)

Common Name	Scientific Name	Growth Habit ²
Apply 1.5 to 2.0 pts/A¹		
Barnyardgrass	<i>Echinochloa crus-galli</i>	A
Beardgrass	<i>Andropogon</i> spp.	P
Bluegrass, annual	<i>Poa annua</i>	A
Bulrush ⁴	<i>Scirpus validus</i>	P
Cogongrass	<i>Imperata cylindrica</i>	P
Cheat	<i>Bromus secalinus</i>	A
Crabgrass	<i>Digitaria</i> spp.	A
Crowfootgrass	<i>Dactyloctenium aegyptium</i>	A
Fall panicum	<i>Panicum dichotomiflorum</i>	A
Goosegrass	<i>Eleusine indica</i>	A
Itchgrass	<i>Rottboellia exaltata</i>	A
Lovegrass ⁴	<i>Eragrostis</i> spp.	P
Maidencane ⁵	<i>Panicum hemitomon</i>	A
Panicum, browntop	<i>Panicum fasciculatum</i>	A
Panicum, Texas	<i>Panicum texanum</i>	A
Prairie threeawn	<i>Aristida oligantha</i>	P
Sandbur, field	<i>Cenchrus incertus</i>	A
Signalgrass	<i>Brachiaria platyphylla</i>	A
Wild barley	<i>Hordeum</i> spp.	A
Woolly cupgrass	<i>Eriochloa villosa</i>	A

Apply 2 to 3 pts/A¹

Bahiagrass	<i>Paspalum notatum</i>	P
Bermudagrass ^{3, 4}	<i>Cynodon dactylon</i>	P
Big bluestem	<i>Andropogon gerardii</i>	P
Dallisgrass	<i>Paspalum dilatatum</i>	P
Feathertop	<i>Pennisetum villosum</i>	P
Guineagrass	<i>Panicum maximum</i>	P
Saltgrass ³	<i>Distichis stricta</i>	P
Sand dropseed	<i>Sporobolus cryptandrus</i>	P
Sprangletop	<i>Leptochloa</i> spp.	A
Timothy	<i>Phleum pratense</i>	P
Wirestem muhly	<i>Muhlenbergia frondosa</i>	P

¹ Use higher rates where heavy or well-established infestations occur.

² Growth Habit: A = Annual, B = Biennial, P = Perennial

³ Use a minimum of 75 GPA.

⁴ Use higher labeled rates.

⁵ Use not permitted in California unless otherwise directed by supplemental labeling.

Broadleaf Weeds

Common Name	Scientific Name	Growth Habit ²
Apply 1.0 to 1.5 pts/A¹		
Burdock	<i>Arctium</i> spp.	B
Carolina geranium	<i>Geranium carolinianum</i>	A
Carpetweed	<i>Mollugo verticillata</i>	A
Clover	<i>Trifolium</i> spp.	A/P
Common chickweed	<i>Stellaria media</i>	A
Common ragweed	<i>Ambrosia artemisiifolia</i>	A
Dandelion	<i>Taraxacum officinale</i>	P
Dogfennel	<i>Eupatorium capillifolium</i>	A
Filaree	<i>Erodium</i> spp.	A
Fleabane	<i>Erigeron</i> spp.	A
Hoary vervain	<i>Verbena stricta</i>	P
Indian mustard	<i>Brassica juncea</i>	A
Kochia	<i>Kochia scoparia</i>	A
Lambsquarters	<i>Chenopodium album</i>	A
Lespedeza ³	<i>Lespedeza</i> spp.	P
Miner's lettuce	<i>Montia perfoliata</i>	A
Mullein	<i>Verbascum</i> spp.	B
Nettleleaf goosefoot	<i>Chenopodium murale</i>	A
Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	P
Pepperweed	<i>Lepidium</i> spp.	A
Pigweed	<i>Amaranthus</i> spp.	A
Puncturevine	<i>Tribulus terrestris</i>	A
Russian thistle	<i>Salsola kali</i>	A
Smartweed	<i>Polygonum</i> spp.	A/P
Sorrell	<i>Rumex</i> spp.	P
Sunflower	<i>Helianthus</i> spp.	A
Sweet clover	<i>Melilotus</i> spp.	A/B
Tansymustard	<i>Descurainia pinnata</i>	A
Western ragweed	<i>Ambrosia psilostachya</i>	P
Wild carrot	<i>Daucus carota</i>	B
Wild lettuce	<i>Lactuca</i> spp.	A/B
Wild parsnip	<i>Pastinaca sativa</i>	B
Wild turnip	<i>Brassica campestris</i>	B
Woollyleaf bursage	<i>Franseria tomentosa</i>	P
Yellow woodsorrel	<i>Oxalis stricta</i>	P

Apply 1.5 to 2.0 pts/A¹

Broom snakeweed ⁴	<i>Gutierrezia sarothrae</i>	P
Bull thistle	<i>Cirsium vulgare</i>	B
Burclover	<i>Medicago</i> spp.	A
Chickweed, mouseear	<i>Cerastium vulgatum</i>	A
Clover, hop	<i>Trifolium procumbens</i>	A

(continued)

Broadleaf Weeds (continued)

Common Name	Scientific Name	Growth Habit ²
Apply 1.5 to 2.0 pts/A¹ (continued)		
Cocklebur	<i>Xanthium strumarium</i>	A
Cudweed	<i>Gnaphalium</i> spp.	A
Desert camelthorn	<i>Alhagi pseudalhagi</i>	P
Dock	<i>Rumex</i> spp.	P
Fiddleneck	<i>Amsinckia intermedia</i>	A
Goldenrod	<i>Solidago</i> spp.	P
Henbit	<i>Lamium amplexicaule</i>	A
Knotweed, prostrate	<i>Polygonum aviculare</i>	A/P
Pokeweed	<i>Phytolacca americana</i>	P
Purslane	<i>Portulaca</i> spp.	A
Rusley, Florida	<i>Richardia scabra</i>	A
Rocket, London	<i>Sisymbrium irio</i>	A
Rush skeletonweed ⁴	<i>Chondrilla juncea</i>	B
Saltbush	<i>Atriplex</i> spp.	A
Shepherdspurse	<i>Capsella bursa-pastoris</i>	A
Spurge, annual	<i>Euphorbia</i> spp.	A
Stinging nettle ⁴	<i>Urtica dioica</i>	P
Velvetleaf	<i>Abutilon theophrasti</i>	A
Yellow starthistle	<i>Centaurea solstitialis</i>	A

Apply 2 to 3 pts/A¹

Arrowwood	<i>Pluchea sericea</i>	A
Canada thistle	<i>Cirsium arvense</i>	P
Giant ragweed	<i>Ambrosia trifida</i>	A
Gray rabbitbrush	<i>Chrysothamnus nauseosus</i>	P
Little mallow	<i>Malva parviflora</i>	B
Milkweed	<i>Asclepias</i> spp.	P
Primrose	<i>Oenothera kunthiana</i>	A
Silverleaf nightshade	<i>Solanum elaeagnifolium</i>	P
Sowthistle	<i>Sonchus</i> spp.	A
Texas thistle	<i>Cirsium texanum</i>	P

¹ Use higher rates where heavy or well-established infestations occur.

² Growth Habit: A = Annual, B = Biennial, P = Perennial

³ Use not permitted in California unless otherwise directed by supplemental labeling.

⁴ For best results, early postemergence applications are required.

Vines and Brambles

Common Name	Scientific Name	Growth Habit ²
Apply 0.5 pt/A		
Field bindweed	<i>Convolvulus arvensis</i>	P
Hedge bindweed	<i>Calystegia sepium</i>	A
Apply 1.0 to 1.5 pts/A¹		
Wild buckwheat	<i>Polygonum convolvulus</i>	P
Apply 1.5 to 2.0 pts/A¹		
Greenbriar	<i>Smilax</i> spp.	P
Honeysuckle ³	<i>Lonicera</i> spp.	P
Morningglory	<i>Ipomoea</i> spp.	A/P
Poison ivy	<i>Rhus radicans</i>	P
Redvine	<i>Brunnichia cirrhusa</i>	P
Wild rose ³	<i>Rosa</i> spp.	P
including:		
Multiflora rose	<i>Rosa multiflora</i>	P
Macartney rose	<i>Rosa bracteata</i>	P
Apply 2 to 3 pts/A¹		
Trumpet creeper	<i>Campsis radicans</i>	P
Virginia creeper	<i>Parthenocissus quinquefolia</i>	P
Wild grape	<i>Vitis</i> spp.	P

¹ Use higher rate where heavy or well-established infestations occur.

² Growth Habit: A = Annual, B = Biennial, P = Perennial

³ Use higher labeled rates.

Brush Species

Common Name	Scientific Name	Growth Habit ²
Apply 1 to 2 pts/A¹		
Brazilian peppertree	<i>Schinus terebinthifolius</i>	P
Chinese tallow tree	<i>Sapium sebiferum</i>	P
Popcorn tree		
Russian olive	<i>Elaeagnus angustifolia</i>	P
Sumac	<i>Rhus</i> spp.	P
Willow	<i>Salix</i> spp.	P
Apply 2 to 3 pts/A¹		
Alder	<i>Alnus</i> spp.	P
American beech	<i>Fagus grandifolia</i>	P
Ash ³	<i>Fraxinus</i> spp.	P
Aspen	<i>Populus</i> spp.	P
Autumn olive	<i>Elaeagnus umbellata</i>	P
Bald cypress	<i>Taxodium distichum</i>	P
Bigleaf maple	<i>Acer macrophyllum</i>	P
Birch ³	<i>Betula</i> spp.	P
Black gum ⁴	<i>Nyssa sylvatica</i>	P
Black locust ⁵	<i>Robinia pseudoacacia</i>	P
Black oak	<i>Quercus kelloggii</i>	P

(continued)

Brush Species (continued)

Common Name	Scientific Name	Growth Habit ²
Apply 2 to 3 pts/A¹ (continued)		
Boxelder	<i>Acer negundo</i>	P
Ceanothis	<i>Ceanothis</i> spp.	P
Cherry ^{3,4}	<i>Prunus</i> spp.	P
Chinaberry	<i>Melia azedarach</i>	P
Chinquapin	<i>Castanopsis chrysophylla</i>	P
Cottonwood	<i>Populus trichocarpa</i> <i>P. deltoides</i>	P
Cypress	<i>Taxodium</i> spp.	P
Dogwood ²	<i>Cornus</i> spp.	P
Elm ⁴	<i>Ulmus</i> spp.	P
Eucalyptus	<i>Eucalyptus</i> spp.	P
Hawthorn	<i>Crataegus</i> spp.	P
Hickory ³	<i>Carya</i> spp.	P
Honeylocust ⁵	<i>Gleditsia triacanthos</i>	P
Huckleberry	<i>Gaylussacia</i> spp.	P
Lyonia spp. including:		
Fetterbush	<i>Lyonia lucida</i>	
Staggerbush	<i>Lyonia mariana</i>	P
Madrone	<i>Arbutus menziesii</i>	P
Maple	<i>Acer</i> spp.	P
Melaleuca	<i>Melaleuca quinquenervia</i>	P
Mulberry ^{2,7}	<i>Morus</i> spp.	P
Oak ⁴	<i>Quercus</i> spp.	P
Persimmon ⁴	<i>Diospyros virginiana</i>	P
Pine ^{5,10}	<i>Pinus</i> spp.	P
Poison oak	<i>Rhus diversiloba</i>	P
Poplar	<i>Populus</i> spp.	P
Privet	<i>Ligustrum vulgare</i>	P
Red alder	<i>Alnus rubra</i>	P
Red maple	<i>Acer rubrum</i>	P
Saltcedar	<i>Tamarix pentandra</i>	P
Sassafras	<i>Sassafras albidum</i>	P
Sourwood ⁴	<i>Oxydendrum arboreum</i>	P
Sweetgum	<i>Liquidambar styraciflua</i>	P
Sycamore	<i>Platanus occidentalis</i>	P
Tanoak ²	<i>Lithocarpus densiflorus</i>	P
Tit ⁹	<i>Cyrilla racemiflora</i>	P
Tree of heaven	<i>Ailanthus altissima</i>	P
Vaccinium spp. including:		
Blueberry	<i>Vaccinium</i> spp.	
Sparkleberry	<i>Vaccinium arboreum</i>	P
Water willow ¹⁰	<i>Justicia americana</i>	P
Yellow poplar ³	<i>Liriodendron tulipifera</i>	P

(continued)

Brush Species *(continued)*

¹ Use the higher rates where heavy or well-established infestations occur.

² Growth Habit: A = Annual, B = Biennial, P = Perennial

³ Use higher labeled rates.

⁴ Best control with applications prior to formation of fall leaf color

⁵ Tank mix with glyphosate or triclopyr

⁶ Tank mix with glyphosate

⁷ Degree of control may be species dependent.

⁸ For water oak (*Quercus nigra*), laurel oak (*Q. lauriflora*), willow oak (*Q. phellos*) and live oak (*Q. virginiana*), use higher labeled rates.

⁹ Suppression only

¹⁰ **Use not permitted in California unless otherwise directed by supplemental labeling.**

Conditions of Sale and Warranty

The **Directions For Use** of this product reflect the opinion of experts based on field use and tests. The directions are believed to be reliable and must be followed carefully. However, it is impossible to eliminate all risks inherently associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or use of the product in a manner inconsistent with its labeling, all of which are beyond the control of BASF CORPORATION ("BASF") or the Seller. To the extent consistent with applicable law, all such risks shall be assumed by the Buyer.

BASF warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes referred to in the **Directions For Use**, subject to the inherent risks, referred to above.

TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BASF MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS OR MERCHANTABILITY OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BUYER'S EXCLUSIVE REMEDY AND BASF'S EXCLUSIVE LIABILITY, WHETHER IN CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY, OR OTHERWISE, SHALL BE LIMITED TO REPAYMENT OF THE PURCHASE PRICE OF THE PRODUCT.

TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, BASF AND THE SELLER DISCLAIM ANY LIABILITY FOR CONSEQUENTIAL, EXEMPLARY, SPECIAL OR INDIRECT DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT.

BASF and the Seller offer this product, and the Buyer and User accept it, subject to the foregoing **Conditions of Sale and Warranty** which may be varied only by agreement in writing signed by a duly authorized representative of BASF.

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Based on: NVA 2017-04-104-0175
Supersedes: NVA 2011-04-104-0062

BASF Corporation
26 Davis Drive
Research Triangle Park, NC 27709



We create chemistry

Arsenal[®]

Herbicide

Applicators Concentrate

For the control of undesirable vegetation growing within specified aquatic sites, forestry sites, pasture/rangeland, and nonagricultural lands; and for the establishment and maintenance of wildlife openings, release of unimproved Bermudagrass and Bahiagrass, bareground weed control, and for use under certain paved surfaces

Active Ingredient:

isopropylamine salt of imazapyr:

(2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid)*..... 53.1%

Other Ingredients:..... 46.9%

Total:..... 100.0%

* Equivalent to 43.3% 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid or 4 pounds acid per gallon

EPA Reg. No. 241-299

EPA Est. No. 241-PR-002

KEEP OUT OF REACH OF CHILDREN CAUTION/PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

See attached booklet for complete **Precautionary Statements, Directions For Use, Conditions of Sale and Warranty**, and state-specific crop and/or use site restrictions.

FIRST AID: If swallowed: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. **DO NOT** induce vomiting unless told to by a poison control center or doctor. **DO NOT** give anything to an unconscious person. **If on skin or clothing:** Take off contaminated clothing. Rinse skin immediately with plenty of water for 15 to 20 minutes. Call a poison control center or doctor for treatment advice. **If inhaled:** Move person to fresh air. If person is not breathing, call 911 or an ambulance; then give artificial respiration, preferably by mouth to mouth, if possible. Call a poison control center or doctor for further treatment advice. **If in eyes:** Hold eyes open and rinse slowly and gently with water for 15 to 20 minutes. Remove contact

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26 Davis Drive
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Net Contents: 2.5 gallons

lenses, if present, after first 5 minutes; then continue rinsing eyes. Call a poison control center or doctor for treatment advice. **HOTLINE NUMBER:** Have the product container or label with you when calling a poison control center or doctor or going for treatment. In case of an emergency endangering life or property involving this product, call BASF Corporation for emergency medical treatment information, day or night 1-800-832-HELP (4357).

Precautionary Statements

Hazards to Humans and Domestic Animals

CAUTION. Harmful if swallowed. Avoid contact with skin, eyes, or clothing. Avoid breathing spray mist.

Physical and Chemical Hazards

Spray solutions of **Arsenal[®]** herbicide **Applicators Concentrate** must be mixed, stored and applied only in stainless steel, fiberglass, plastic and plastic-lined steel containers.

Thoroughly clean application equipment, including landing gear, immediately after use of this product. Prolonged exposure of this product to uncoated steel (except stainless steel) surfaces may result in corrosion and failure of the exposed part. The maintenance of an organic coating (paint) may prevent corrosion.

Environmental Hazards

This product is toxic to plants. Drift and runoff may be hazardous to plants in water adjacent to treated areas. **DO NOT** apply to water except as specified in this label. Treatment of aquatic weeds may result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss may cause the suffocation of some aquatic organisms. **DO NOT** treat more than 1/2 of the surface area of the water in a single operation and wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow aquatic organisms to move into untreated areas. **DO NOT** contaminate water when disposing of equipment washwaters or rinsate.

This pesticide is toxic to vascular plants and must be used strictly in accordance with the drift precautions on the label.

STORAGE AND DISPOSAL

DO NOT contaminate water, food or feed by storage or disposal.

Pesticide Storage

DO NOT store below 10° F.

Pesticide Disposal

Wastes resulting from the use of this product must be disposed of on-site or at an approved waste disposal facility.

Container Handling

Nonrefillable Container. DO NOT reuse or refill this container. Triple rinse or pressure rinse container (or equivalent) promptly after emptying; then offer for recycling, if available, or reconditioning, if appropriate, or puncture and dispose of in a sanitary landfill, or by incineration, or by other procedures approved by state and local authorities.

See attached booklet for complete container handling directions including triple rinsing and pressure rinsing instructions.

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1. Identification

Product identifier used on the label

ARSENAL HERBICIDE APPL. CONC.

Recommended use of the chemical and restriction on use

Recommended use*: herbicide

* The "Recommended use" identified for this product is provided solely to comply with a US Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:

BASF CORPORATION
100 Park Avenue
Florham Park, NJ 07932, USA

Telephone: +1 973 245-6000

Emergency telephone number

CHEMTREC: 1-800-424-9300
BASF HOTLINE: 1-800-832-HELP (4357)

Other means of identification

Substance number: 57487
EPA Register number: 241-299
Molecular formula: C(13) H(15) N(3) O(3). C(3) H(9) N
Chemical family: imidazole derivative
Synonyms: Isopropylamine salt of imazapyr

2. Hazards Identification

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Classification of the product

Aquatic Acute	1	Hazardous to the aquatic environment - acute
Aquatic Chronic	1	Hazardous to the aquatic environment - chronic

Label elements

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The product does not require a hazard warning label in accordance with GHS criteria.

Hazards not otherwise classified

Labeling of special preparations (GHS):

The following percentage of the mixture consists of components(s) with unknown hazards regarding the acute toxicity: 0 - 1 % dermal

The following percentage of the mixture consists of components(s) with unknown hazards regarding the acute toxicity: 0 - 1 % oral

The following percentage of the mixture consists of components(s) with unknown hazards regarding the acute toxicity: 0 - 1 % Inhalation - vapour

The following percentage of the mixture consists of components(s) with unknown hazards regarding the acute toxicity: 0 - 1 % Inhalation - mist

According to Regulation 1994 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Emergency overview

CAUTION:

KEEP OUT OF REACH OF CHILDREN.

Avoid contact with the skin, eyes and clothing.

Avoid inhalation of mists/vapours.

3. Composition / Information on Ingredients

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

<u>CAS Number</u>	<u>Content (W/W)</u>	<u>Chemical name</u>
81510-83-0	53.1 %	Isopropylamine salt of imazapyr
64-19-7	0.1 - 1.0 %	Acetic acid
75-31-0	5.0 - 10.0 %	isopropylamine

According to Regulation 1994 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

<u>CAS Number</u>	<u>Content (W/W)</u>	<u>Chemical name</u>
81510-83-0	53.1 %	Isopropylamine salt of imazapyr
	46.9 %	Proprietary ingredients

4. First-Aid Measures

Description of first aid measures

General advice:

Remove contaminated clothing.

If inhaled:

Keep patient calm, remove to fresh air.

If on skin:

Wash thoroughly with soap and water.

If in eyes:

Wash affected eyes for at least 15 minutes under running water with eyelids held open.

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If swallowed:

Rinse mouth and then drink plenty of water.

Most important symptoms and effects, both acute and delayed

Symptoms: No significant reaction of the human body to the product known.

Indication of any immediate medical attention and special treatment needed

Note to physician

Antidote: No known specific antidote.

Treatment: Treat symptomatically.

Treatment: Symptomatic treatment (decontamination, vital functions).

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
foam, dry powder, carbon dioxide, water spray

Special hazards arising from the substance or mixture

Hazards during fire-fighting:
carbon monoxide, carbon dioxide, nitrogen oxide, nitrogen dioxide, Hydrocarbons,
If product is heated above decomposition temperature, toxic vapours will be released. The substances/groups of substances mentioned can be released if the product is involved in a fire.

Advice for fire-fighters

Protective equipment for fire-fighting:
Firefighters should be equipped with self-contained breathing apparatus and turn-out gear.

Further information:

Evacuate area of all unnecessary personnel. Contain contaminated water/firefighting water. Do not allow to enter drains or waterways.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Take appropriate protective measures. Clear area. Shut off source of leak only under safe conditions. Extinguish sources of ignition nearby and downwind. Ensure adequate ventilation. Wear suitable personal protective clothing and equipment.

Environmental precautions

Do not discharge into the subsoil/soil. Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

Dike spillage. Pick up with suitable absorbent material. Place into suitable containers for reuse or disposal in a licensed facility. Spilled substance/product should be recovered and applied according to label rates whenever possible. If application of spilled substance/product is not possible, then spills should be contained, solidified, and placed in suitable containers for disposal. After decontamination, spill area can be washed with water. Collect wash water for approved disposal.

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7. Handling and Storage

Precautions for safe handling

RECOMMENDATIONS ARE FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS. PESTICIDE APPLICATORS & WORKERS must refer to the Product Label and Directions for Use attached to the product for Agricultural Use Requirements in accordance with the EPA Worker Protection Standard 40 CFR part 170. Ensure adequate ventilation. Provide good ventilation of working area (local exhaust ventilation if necessary). Keep away from sources of ignition - No smoking. Keep container tightly sealed. Protect contents from the effects of light. Protect against heat. Protect from air. Handle and open container with care. Do not open until ready to use. Once container is opened, content should be used as soon as possible. Avoid aerosol formation. Avoid dust formation. Provide means for controlling leaks and spills. Do not return residues to the storage containers. Follow label warnings even after container is emptied. The substance/ product may be handled only by appropriately trained personnel. Avoid all direct contact with the substance/product. Avoid contact with the skin, eyes and clothing. Avoid inhalation of dusts/mists/vapours. Wear suitable personal protective clothing and equipment.

Protection against fire and explosion:

The relevant fire protection measures should be noted. Fire extinguishers should be kept handy. Avoid all sources of ignition: heat, sparks, open flame. Sources of ignition should be kept well clear. Avoid extreme heat. Keep away from oxidizable substances. Electrical equipment should conform to national electric code. Ground all transfer equipment properly to prevent electrostatic discharge. Electrostatic discharge may cause ignition.

Conditions for safe storage, including any incompatibilities

Segregate from incompatible substances. Segregate from foods and animal feeds. Segregate from textiles and similar materials.

Further information on storage conditions: Keep only in the original container in a cool, dry, well-ventilated place away from ignition sources, heat or flame. Protect containers from physical damage. Protect against contamination. The authority permits and storage regulations must be observed.

8. Exposure Controls/Personal Protection

Users of a pesticidal product should refer to the product label for personal protective equipment requirements.

Components with occupational exposure limits

isopropylamine	OSHA PEL	PEL 5 ppm 12 mg/m ³ ; STEL value 10 ppm 24 mg/m ³ ; TWA value 5 ppm 12 mg/m ³ ;
	ACGIH TLV	TWA value 5 ppm ; STEL value 10 ppm ;

Advice on system design:

Whenever possible, engineering controls should be used to minimize the need for personal protective equipment.

Personal protective equipment

RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:

Respiratory protection:

Wear respiratory protection if ventilation is inadequate. Wear a NIOSH-certified (or equivalent) TC23C Chemical/Mechanical type filter system to remove a combination of particles, gas and

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vapours. For situations where the airborne concentrations may exceed the level for which an air purifying respirator is effective, or where the levels are unknown or Immediately Dangerous to Life or Health (IDLH), use NIOSH-certified full facepiece pressure demand self-contained breathing apparatus (SCBA) or a full facepiece pressure demand supplied-air respirator (SAR) with escape provisions.

Hand protection:

Chemical resistant protective gloves, Protective glove selection must be based on the user's assessment of the workplace hazards.

Eye protection:

Safety glasses with side-shields. Tightly fitting safety goggles (chemical goggles). Wear face shield if splashing hazard exists.

Body protection:

Body protection must be chosen depending on activity and possible exposure, e.g. head protection, apron, protective boots, chemical-protection suit.

General safety and hygiene measures:

Wear long sleeved work shirt and long work pants in addition to other stated personal protective equipment. Work place should be equipped with a shower and an eye wash. Handle in accordance with good industrial hygiene and safety practice. Personal protective equipment should be decontaminated prior to reuse. Gloves must be inspected regularly and prior to each use. Replace if necessary (e.g. pinhole leaks). Take off immediately all contaminated clothing. Store work clothing separately. Hands and/or face should be washed before breaks and at the end of the shift. No eating, drinking, smoking or tobacco use at the place of work. Keep away from food, drink and animal feeding stuffs.

9. Physical and Chemical Properties

Form:	liquid	
Odour:	strong, ammonia-like	
Odour threshold:		Not determined due to potential health hazard by inhalation.
Colour:	green	
pH value:	approx. 5 - 7	(1 %(m), 20 °C)
Freezing point:	approx. 0 °C	(1,013.3 hPa) Information applies to the solvent.
Boiling point:	approx. 100 °C	(1,013.3 hPa) Information applies to the solvent.
Flash point:		not applicable Aqueous preparation
Flammability:	not applicable	
Lower explosion limit:		As a result of our experience with this product and our knowledge of its composition we do not expect any hazard as long as the product is used appropriately and in accordance with the intended use.
Upper explosion limit:		As a result of our experience with this product and our knowledge of its composition we do not expect any hazard as long as the product is used appropriately and in accordance with the intended use.
Autoignition:		not applicable Information applies to the solvent.
Vapour pressure:	approx. 23.4 hPa	(20 °C) Information applies to the solvent.

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Density:	approx. 1.11 g/cm ³	(20 °C)
Vapour density:		not applicable
Partitioning coefficient n-octanol/water (log Pow):		not applicable
Thermal decomposition:	carbon monoxide, carbon dioxide, nitrogen oxide, nitrogen dioxide, Hydrocarbons Stable at ambient temperature. If product is heated above decomposition temperature toxic vapours may be released. If product is heated above decomposition temperature hazardous fumes may be released.	
Viscosity, dynamic:	approx. 46.5 mPa.s	(20 °C)
Solubility in water:		readily soluble
Molar mass:	320.4 g/mol	
Evaporation rate:		not applicable
Other Information:	If necessary, information on other physical and chemical parameters is indicated in this section.	

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Oxidizing properties:
not fire-propagating
Not an oxidizer.

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

Possibility of hazardous reactions

The product is chemically stable.
Hazardous polymerization will not occur. No hazardous reactions if stored and handled as prescribed/indicated.

Conditions to avoid

Avoid all sources of ignition: heat, sparks, open flame. Avoid prolonged storage. Avoid electro-static discharge. Avoid contamination. Avoid prolonged exposure to extreme heat. Avoid extreme temperatures.

Incompatible materials

oxidizing agents, strong alkalies

Hazardous decomposition products

Decomposition products:

Hazardous decomposition products: No hazardous decomposition products if stored and handled as prescribed/indicated., Prolonged thermal loading can result in products of degradation being given off.

Thermal decomposition:

Possible thermal decomposition products:

carbon monoxide, carbon dioxide, nitrogen oxide, nitrogen dioxide, Hydrocarbons

Stable at ambient temperature. If product is heated above decomposition temperature toxic vapours may be released. If product is heated above decomposition temperature hazardous fumes may be released.

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11. Toxicological information

Primary routes of exposure

Routes of entry for solids and liquids are ingestion and inhalation, but may include eye or skin contact. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

Acute Toxicity/Effects

Acute toxicity

Assessment of acute toxicity: Relatively nontoxic after single ingestion. Slightly toxic after short-term skin contact. Relatively nontoxic after short-term inhalation.

Oral

Type of value: LD50

Species: rat

Value: > 5,000 mg/kg

Inhalation

Type of value: LC50

Species: rat (male/female)

Value: > 5.0 mg/l (OECD Guideline 403)

Exposure time: 4 h

An aerosol was tested.

No mortality was observed.

Dermal

Type of value: LD50

Species: rabbit

Value: > 5,000 mg/kg

Irritation / corrosion

Assessment of irritating effects: May cause slight but temporary irritation to the eyes. May cause slight irritation to the skin.

Skin

Species: rabbit

Result: Slightly irritating.

Method: Primary skin irritation test

Eye

Species: rabbit

Result: non-irritant

Sensitization

Assessment of sensitization: Skin sensitizing effects were not observed in animal studies.

Buehler test

Species: guinea pig

Result: Skin sensitizing effects were not observed in animal studies.

Method: OECD Guideline 406

Chronic Toxicity/Effects

Repeated dose toxicity

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Assessment of repeated dose toxicity: The product has not been tested. The statement has been derived from the properties of the individual components. No substance-specific organotoxicity was observed after repeated administration to animals.

Genetic toxicity

Assessment of mutagenicity: The product has not been tested. The statement has been derived from the properties of the individual components. Mutagenicity tests revealed no genotoxic potential.

Carcinogenicity

Assessment of carcinogenicity: The product has not been tested. The statement has been derived from the properties of the individual components. The results of various animal studies gave no indication of a carcinogenic effect.

Reproductive toxicity

Assessment of reproduction toxicity: The product has not been tested. The statement has been derived from the properties of the individual components. The results of animal studies gave no indication of a fertility impairing effect.

Teratogenicity

Assessment of teratogenicity: The product has not been tested. The statement has been derived from the properties of the individual components. Animal studies gave no indication of a developmental toxic effect at doses that were not toxic to the parental animals.

Other Information

Misuse can be harmful to health.

Symptoms of Exposure

No significant reaction of the human body to the product known.

12. Ecological Information

Toxicity

Aquatic toxicity

Assessment of aquatic toxicity:

There is a high probability that the product is not acutely harmful to fish. There is a high probability that the product is not acutely harmful to aquatic invertebrates. Acutely harmful for aquatic plants.

Very toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment. The product has not been tested. The statement has been derived from the properties of the individual components.

Toxicity to fish

Information on: Imazapyr

LC50 (96 h) >100PPM, Oncorhynchus mykiss (static)

LC50 (96 h) >100 ppm, Lepomis macrochirus (static)

Aquatic invertebrates

Information on: Imazapyr

EC50 (24 h) > 100 ppm, Daphnia magna

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Aquatic plants

Information on: Imazapyr
EC50 (96 h) >1 ppm, Selenastrum capricornutum (static)
EC50 (14 d) 24, Lemna gibba

Assessment of terrestrial toxicity

With high probability not acutely harmful to terrestrial organisms.

Other terrestrial non-mammals

Information on: imazapyr
LC50, Anas platyrhynchos
With high probability not acutely harmful to terrestrial organisms.
LD50 > 100 ug/bee, Apis mellifera
With high probability not acutely harmful to terrestrial organisms.

Persistence and degradability

Assessment biodegradation and elimination (H2O)

Information on: Imazapyr

Bioaccumulative potential

Assessment bioaccumulation potential

The product has not been tested. The statement has been derived from the properties of the individual components.

Bioaccumulation potential

Information on: Imazapyr

Bioconcentration factor: < 1.0, Lepomis macrochirus
Does not accumulate in organisms.

Mobility in soil

Assessment transport between environmental compartments

The product has not been tested. The statement has been derived from the properties of the individual components.

Information on: Imazapyr

The substance will not evaporate into the atmosphere from the water surface.
Following exposure to soil, the product trickles away and can - dependant on degradation - be transported to deeper soil areas with larger water loads.

Additional information

Other ecotoxicological advice:

The ecological data given are those of the active ingredient. Do not release untreated into natural waters.

Safety Data Sheet

ARSENAL HERBICIDE APPL. CONC.

Revision date : 2014/12/23
Version: 3.0

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(30497129/SDS_CPA_US/EN)

13. Disposal considerations

Waste disposal of substance:

Pesticide wastes are regulated. Improper disposal of excess pesticide, spray mix or rinsate is a violation of federal law. If pesticide wastes cannot be disposed of according to label instructions, contact the State Pesticide or Environmental Control Agency or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Container disposal:

Rinse thoroughly at least three times (triple rinse) in accordance with EPA recommendations. Consult state or local disposal authorities for approved alternative procedures such as container recycling. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers.

RCRA:

This product is not regulated by RCRA.

14. Transport Information

Land transport

USDOT

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Hazard class: 9
Packing group: III
ID number: UN 3082
Hazard label: 9, EHSM
Marine pollutant: YES
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (contains IMAZAPYR 43%)

Air transport

IATA/ICAO

Hazard class: 9
Packing group: III
ID number: UN 3082
Hazard label: 9, EHSM
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (contains IMAZAPYR 43%)

15. Regulatory Information

Federal Regulations

Registration status:

Chemical TSCA, US blocked / not listed

Crop Protection TSCA, US released / listed

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EPCRA 311/312 (Hazard categories): Acute; Chronic

NFPA Hazard codes:

Health : 1 Fire: 1 Reactivity: 0 Special:

Labeling requirements under FIFRA

This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label.

CAUTION:

KEEP OUT OF REACH OF CHILDREN.

Avoid contact with the skin, eyes and clothing.

Avoid inhalation of mists/vapours.

16. Other Information

SDS Prepared by:

BASF NA Product Regulations

SDS Prepared on: 2014/12/23

We support worldwide Responsible Care® initiatives. We value the health and safety of our employees, customers, suppliers and neighbors, and the protection of the environment. Our commitment to Responsible Care is integral to conducting our business and operating our facilities in a safe and environmentally responsible fashion, supporting our customers and suppliers in ensuring the safe and environmentally sound handling of our products, and minimizing the impact of our operations on society and the environment during production, storage, transport, use and disposal of our products.

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END OF DATA SHEET



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

Memorandum

To: Board of Pesticides Control

From: Pamela J Bryer, Ph.D. | Pesticides Toxicologist

Subject: New developments and a correction on PFAS definitions in relations to LD 264

Date: November 19, 2021

PFAS definition for LD 264 implementation

In order to implement the affidavits required by LD 264 a definition of PFAS needs to be established.

Discussions led by staff covering the classification of PFAS for the implementation of LD 264 previously focused on classifying PFAS by risk. All chemical compounds have inherent toxicity, thus, they are regulated based on the potential for harm by carefully regulating the exposure in a manner dependent on their toxicity. Pesticide active ingredients and adjuvants intended for use on foods undergo a much higher level of risk categorization than most industrial chemicals. PFAS compounds have a higher degree of unknown risk because they were not required to undergo the same level of risk assessment prior to use. A number of PFAS compounds are now linked to a variety of human health issues. The public's discovery of the ubiquity of PFAS in most all types of consumer goods has led to a push to eliminate use of all PFAS as soon as possible. Regulating PFAS together as one class has become a go-to approach to dealing with the uncertainty surrounding all the different PFAS chemistries.

The State of Maine recently adopted LD 1503, *An Act To Stop Perfluoroalkyl and Polyfluoroalkyl Substances Pollution*. This law requires the Maine Department of Environmental Protection (DEP) to start collecting information on PFAS entering the state and then later prohibit PFAS. DEP will have discretion to determine if individual PFAS can still be used within the state. Within LD 1503 exists the following definition of PFAS:

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F. "Perfluoroalkyl and polyfluoroalkyl substances" or "PFAS" means substances that include any member of the class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom.

BPC staff met with DEP in October to discuss LD 1503. In the course of the discussion DEP indicated that they typically regulate hazardous chemicals based on their risk potential, for example in 38 MRSA 16-D *Toxic Chemicals in Children's Products*, but that because of the language of LD 1503 that was not an option for PFAS. PFAS in Maine will be regulated based whether or not they include "at least one fully fluorinated carbon atom".

Follow up staff discussions concluded, adopting the definition set in LD 1503 would be the prudent approach as it allows for harmonization across the state's requirements. Pesticide registrants will be required to comply with LD 1503 in addition to LD 264. One definition across all departments will aid compliance through increased clarity and communication.

Staff encourage the board to consider this change as part of rulemaking under LD 264.

Correction from a previous memo's PFAS definition lists

In an August 19th memo to the board, a PFAS definition list containing 190 pesticide active ingredients and inert ingredients was attributed to the Office of Pesticide Pollution and Toxics (OPPT) and Office of Pesticide Programs (OPP) as being produced by their "working definition". OPP has stated that there are approximately three pesticide products that fit with their "working definition" of PFAS. A careful review of their website shows that OPP has a definition that is actually much closer to "two fully fluorinated carbons" (although that is a simplification of their definition). The OPP definition essentially requires a two-carbon chain to meet the definition of PFAS. The list of 190 products previously reported was collected from an EPA website not related to OPP and that list has since been removed from the CompTox website. When asked, EPA responded that those lists were test runs for an upcoming list. Within the next month or so the CompTox Dashboard plans to release a more comprehensive list matching the -CF₂- and -CF₃ structures to the full PFAS Master List.

This clarification note underscores the confusion created by this rapidly changing topic. Confusion on this topic should lessen once an understanding of what defines a PFAS has been established and accepted.

A currently widely cited definition of PFAS has recently been published by Organization for Economic Cooperation and Development (OECD):

PFASs are defined as fluorinated substances that contain at least one fully fluorinated methyl or methylene carbon atom (without any H/Cl/Br/I atom attached to it), i.e. with a few noted exceptions, any chemical with at least a perfluorinated methyl group (-CF₃) or a perfluorinated methylene group (-CF₂-) is a PFAS.

This OECD definition is similar to the State of Maine's newly adopted definition; however, OECD's definition is more descriptive with less ambiguity in the potential included chemical structures. OECD comments that this new definition which increases the number of PFAS structures up from Buck et al. 2011 (the primary scientific reference used in PFAS definition discussions) is, "not connected to decisions on how PFASs should be grouped in regulatory and voluntary actions". They further state,

"The term "PFASs" is a broad, general, non-specific term, which does not inform whether a compound is harmful or not, but only communicates that the compounds under this term share the same trait for having a fully fluorinated methyl or methylene carbon moiety."

Once the ground has been established for what qualifies as a PFAS, resources can be dedicated to determining the risk profiles of the different chemicals.

References:

Buck et al. Buck RC, Franklin J, Berger U, Conder JM, Cousins IT, De Voogt P, et al. 2011. Perfluoroalkyl and polyfluoroalkyl substances in the environment: terminology, classification, and origins. *Integrated Environmental Assessment and Management* 7(4), 513–541, <https://doi.org/10.1002/ieam.258>

Maine Department of Environmental Protection webpages:

Chemicals of Concern. <https://www.maine.gov/dep/safechem/childrens-products/concern/index.html>

Priority Chemicals. <https://www.maine.gov/dep/safechem/childrens-products/priority/index.html>

PFAS. <https://www.maine.gov/dep/spills/topics/pfas/>

OECD (2021), *Reconciling Terminology of the Universe of Per- and Polyfluoroalkyl Substances: Recommendations and Practical Guidance*, OECD Series on Risk Management, No. 61, OECD Publishing, Paris.



STATE OF MAINE
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BOARD OF PESTICIDES CONTROL
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JANET T. MILLS
GOVERNOR

AMANDA E. BEAL
COMMISSIONER

To: Board Members
From: Staff
Re: Review of Potential Rulemaking in Response to LD 155 and LD 264
Date: November 19, 2021

On June 10, 2021 LD 155 and LD 264 were signed by the Governor. These resolves, in part, directed the Board to conduct rulemaking. Staff have proposed potential responses to these rulemaking directives. All items are organized by the resolve in which they are referenced and are otherwise organized as follows:

The provided rule chapters include numbers corresponding to those in column one. These are the proposed locations of the rulemaking concepts.

The second column details the actionable item.

The third column provides a detailed description of the potential rulemaking concept.

The fourth column gives details regarding the steps that have been taken by staff to develop the current rule.

Complete list of possible rulemaking chapters: 20, 41

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LD 264— Resolve, Directing the Board of Pesticides Control To Gather Information Relating to Perfluoroalkyl and Polyfluoroalkyl Substances in the State			
1	Chapter 20 – new definitions, state definition of PFAS and definition of PFAS adulteration	“Perfluoroalkyl and Polyfluoroalkyl Substances” or “PFAS” means substances that include any member of the class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom.	Meeting with staff to discuss PFAS definitions and rule, 1503 definition incorporated.
LD 155— Resolve, Directing the Board of Pesticides Control To Prohibit the Use of Certain Neonicotinoids for Outdoor Residential Use			
2	Chapter 41—new section—definitions	<p>“Invasive Invertebrate Pests” means any invertebrate species, including its eggs or other biological materials capable of propagating that species, that does or is likely to cause economic or environmental harm or harm to human health and meets one or more of the following criteria:</p> <ol style="list-style-type: none"> a. federally or state regulated; b. non-native or not originating from this eco-region; c. native or non-native vectors of plant diseases; d. native pests that have become highly destructive due to climate change or ecosystem factors <p>“Ornamental Plants” means shrubs, trees, and related vegetation, excluding mown turf and lawn, in and around residences.</p>	<p>Initial staff interpretation of definition needed more clarity. Meeting with IPM professionals in department on 11/1 determined that this definition would be sufficient with a list of criteria to meet invasive invertebrate pest definition.</p> <p>Ornamental plant definition amended to exclude turf, lawn, and grass.</p>
3	Chapter 41—new section—publication of a product list	The Board of Pesticides Control will publish by X 2022 and by March 15th of each year thereafter a list of insecticide products containing dinotefuran, clothianidin, imidacloprid or thiamethoxam registered in Maine for which the	<p>Kept from previous versions.</p> <p>A publish date is needed to complete this section.</p>

		<p>manufacturer has verified that there is an outdoor ornamental vegetation or turf use on the pesticide label. Based on available information, the Board may exempt from this list pesticides that it determines are not for use in the control of outdoor ornamental plant or turf. Pesticides labeled solely for use in preserving wood, managing indoor pests, managing structural pests within five (5) feet of a human dwelling, and treating pets are specifically exempt from this list.</p>	
4	<p>Chapter 41—new section—licensing requirements</p>	<p>I. No person shall purchase, use or supervise the use of any pesticides containing dinotefuran, clothianidin, imidacloprid, or thiamethoxam identified on the Board's annual listing unless they have obtained a private or commercial pesticide applicator's license from the Board.</p> <p>II. Unless exempted under Chapter 41, Section 6 (B) (IV) no person shall purchase, use or supervise the use of any pesticides containing dinotefuran, clothianidin, imidacloprid, or thiamethoxam in outdoor residential landscapes to include ornamental plants and turf.</p> <p>III. Distribute any pesticides containing dinotefuran, clothianidin, imidacloprid, or thiamethoxam identified on the Board's annual listing without a restricted use pesticide dealer's license from the Board.</p> <p>IV. Registered pesticides containing dinotefuran, clothianidin, imidacloprid or thiamethoxam and identified on the Board's annual listing are exempt from the prohibition of use described in Chapter 41, Section 5 (B) (II) where used for management of an</p>	<p>All of these sections were kept from previous versions but subsection 4 was modified to reference invasive invertebrate pests and ornamental plants instead of referencing the Maine State Horticulturalist and Maine State Entomologist.</p>

		invasive invertebrate pest of ornamental plants.	
5	Chapter 41—new section—effective date	This section becomes effective January 1, XXX.	<p>During the stakeholder information gathering meetings, members of the public suggested implementation of a two-year discontinuance, and a “phase out date” of January 1, 2024, similar to the timeline outlined for LD 316.</p> <p>A definitive phase out date is needed to complete rulemaking.</p>

01 DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY**026 BOARD OF PESTICIDES CONTROL****Chapter 20: SPECIAL PROVISIONS**

SUMMARY: These provisions regulate the use, storage and disposal of pesticides with specific emphasis on registered pesticides, right of way and aquatic applications and employer/employee requirements.

Section 1. Registered Pesticides**A. Definitions**

“Perfluoroalkyl and polyfluoroalkyl substances” or “PFAS” means substances that include any member of the class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom.

- AB.** The use of any pesticide not registered by the Maine Board of Pesticides Control in accordance with Title 7 M.R.S.A. §601 is prohibited except as otherwise provided in this chapter or by FIFRA, Section 2(ee).
- BC.** The use of registered pesticides for other than registered uses, or at greater than registered dosages, or at more frequent than registered intervals is prohibited, provided that application or use of unregistered pesticides and unregistered applications or uses of registered pesticides may be made for experimental purposes if in accordance with requirements of the Maine Board of Pesticides Control, and the U.S. Environmental Protection Agency.
- CD.** Retailers and end users of pesticides no longer registered in Maine may continue to sell and use those items provided they were properly registered when obtained and such distribution and use is not prohibited by FIFRA or other Federal law.
- DE.** In conducting review of registration or re-registration pursuant to 7 M.R.S.A. §607-A, the Board may consider the potential for environmental damage by the pesticide through direct application on or off-target or by reason of drift. If the Board finds that the use of the pesticide is anticipated to result in significant adverse impacts on the environment, whether on or off-target, which cannot be avoided or adequately mitigated, registration or re-registration will not be granted unless the Board finds that anticipated benefits of registration clearly outweigh the risks. In any case where the Board may request data in connection with registration or re-registration of any pesticide, such data may include that concerning pesticide residues, propensity for drift and testing therefor. Such data, if requested, shall provide information regarding residues and residue effects on plant tissues, soil and water and other potential deposition sites, and shall take into consideration differences in plants, soils, climatic conditions at the time of application and application techniques.

F. In conducting review of registration or reregistration pursuant to 7 M.R.S.A §607-A, the Board shall require submission of the confidential statement of formula and the following affidavits:

1. a completed and signed form provided by the Board at the time of application for product registration review or reregistration which attests that the pesticide has or has never been stored, distributed, or packaged in a fluorinated high-density polyethylene container; and
2. a completed and signed form provided by the Board at the time of application for product registration review or reregistration which attests that the pesticide formulation does or does not contain perfluoroalkyl or polyfluoroalkyl substances as defined by the Board for this purpose of this section.

Section 2. Right-of-Way

Deciduous growth over six feet in height and evergreen growth over three feet in height shall not be sprayed with a herbicide within the right-of-way of any public way except that deciduous growth which has been cut to the ground and which has grown more than six feet during the growing season following the cutting, may be sprayed that following season. In addition, chemical pruning of single limbs of trees over the prescribed heights may be performed.

Section 3. Pesticide Storage and Disposal

- A. Unused pesticides, whether in sealed or open containers, must be kept in a secure enclosure and otherwise maintained so as to prevent unauthorized use, mishandling or loss; and so as to prevent contamination of the environment and risk to public health.
- B. Obsolete, expired, illegal, physically or chemically altered or unusable pesticides, except household pesticide products, shall be either:
 1. stored in a secure, safe place under conditions that will prevent deterioration of containers or any contamination of the environment or risk to public health, or
 2. returned to the manufacturer or formulator for recycling, destruction, or disposal as appropriate, or
 3. disposed of in a licensed hazardous waste facility or other approved disposal site that meets or exceeds all current requirements of the Maine Department of Environmental Protection and the U.S. Environmental Protection Agency for facilities receiving such waste.

Section 4. Aquatic Applications

No person, firm, corporation or other legal entity shall, for the purpose of controlling aquatic pests, apply any pesticide to or in any waters of the state as defined in 38 M.R.S.A. §361-A(7) without approval of the Maine Department of Environmental Protection.

Section 5. Employer/Employee Requirements

- A. Any person applying pesticide shall instruct their employees and those working under their direction about the hazards involved in the handling of pesticides to be employed as set forth on the pesticide label and shall instruct such persons as to the proper steps to be taken to avoid such hazards.
- B. Any person applying pesticides shall provide and maintain, for the protection of their employees and persons working under their direction, the necessary safety equipment as set forth on the label of the pesticide to be used.

Section 6. Authorization for Pesticide Applications

- A. Authorization to apply pesticides to private property is not required when a pesticide application is made by or on behalf of the holder of an easement or right of way, for the purposes of establishing or maintaining such easement or right of way.
- B. When the Maine Center for Disease Control and Prevention (CDC) has identified that an organism is a vector of human disease and the vector and disease are present in an area, a government entity shall obtain authorization for ground-based applications by:
 - 1. Sending a written notice to the person(s) owning property or using residential rental, commercial or institutional buildings within the intended target site at least three days but not more than 60 days before the commencement of the intended spray applications. For absentee property owners who are difficult to locate, mailing of the notice to the address listed in the Town tax record shall be considered sufficient notice; and
 - 2. Implementing an “opt out” option whereby residents and property owners may request that their property be excluded from the application by submitting written notice to the government entity at least 24 hours before spraying is scheduled to commence. Authorization is considered given for any property for which written notice was submitted and no “opt out” request was received by the sponsoring government entity.
- C. When the Maine Center for Disease Control and Prevention (CDC) recommends control of disease vectors, government entities are not required to receive prior authorization to apply pesticides to private property, provided that the government entity sponsoring the vector control program:
 - 1. Provides advance notice to residents about vector control programs using multiple forms of publicity which may include, but is not limited to, signs, newspaper, television or radio notices, direct mailings, electronic communication or other effective methods; and

2. Implements an “opt out” option whereby residents and property owners may request that their property be excluded from any ground based control program and the government entity makes a reasonable effort to honor such requests; and
 3. If aerial applications are made, takes affirmative steps, to the extent feasible, to avoid applications to exclusion areas as identified by Board policy.
- D. **General Provisions.** For any pesticide application not described in Chapter 20.6(A),(B) or (C), the following provision apply:
1. No person may contract with, or otherwise engage, a pesticide applicator to make any pesticide application to property unless that person is the owner, manager, or legal occupant of the property to which the pesticide is to be applied, or that person has the authorization of the owner, manager or legal occupant to enter into an agreement for pesticide applications to be made to that property. The term “legal occupant” includes tenants of rented property.
 2. No person may apply a pesticide to a property of another unless prior authorization for the pesticide application has been obtained from the owner, manager or legal occupant of that property. The term “legal occupant” includes tenants of rented property.
 3. No commercial applicator may perform ongoing, periodic non-agricultural pesticide applications to a property unless:
 - i. there is a signed, written agreement with the property owner, manager or legal occupant that explicitly states that such pesticide applications shall continue until a termination date specified in the agreement, unless sooner terminated by the applicator or property owner, manager or legal occupant; or
 - ii. the commercial applicator utilizes another system of verifiable authorization approved by the Board that provides substantially equivalent assurance that the customer is aware of the services to be provided and the terms of the agreement.

Section 7. Positive Identification of Proper Treatment Site

- A. Commercial applicators making outdoor treatments to residential properties must implement a system, based on Board approved methods, to positively identify the property of their customers. The Board shall adopt a policy listing approved methods of positive identification of the proper treatment site.

STATUTORY AUTHORITY: Title 22 M.R.S.A., Chapter 258-A

EFFECTIVE DATE:
July 6, 1979

AMENDMENT EFFECTIVE:

April 1, 1985
January 1, 1988
May 21, 1996

EFFECTIVE DATE (ELECTRONIC CONVERSION):

March 1, 1997

AMENDED:

May 7, 1997 - Section 5

CONVERTED TO MS WORD:

March 11, 2003

CORRECTED HEADER CHAPTER NUMBER:

January 10, 2005

AMENDED:

January 1, 2008 – new Sections 6 and 7, filing 2007-65
September 13, 2012 – Section 6(E) and references added, filing 2012-270 (Emergency – expires in 90 days unless proposed and adopted in the meantime as non-emergency)
December 12, 2012 – emergency filing expires, chapter reverts to January 1, 2008 version
September 13, 2012 – Section 6(E) and references added, filing 2012-270 (Emergency – expires in 90 days unless proposed and adopted in the meantime as non-emergency)
December 12, 2012 – emergency filing expires, chapter reverts to January 1, 2008 version
June 12, 2013 – Emergency major substantive filing 2013-134

CORRECTIONS:

February, 2014 – agency names, formatting

AMENDED:

September 11, 2014 – filing 2014-163 (Final adoption, major substantive)
December 9, 2014 – Section 7 added, filing 2014-279

01 DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY**026 BOARD OF PESTICIDES CONTROL****Chapter 41: SPECIAL RESTRICTIONS ON PESTICIDE USE**

SUMMARY: This chapter describes special limitations placed upon the use of (1) aldicarb (Temik 15G) in proximity to potable water bodies; (2) trichlorfon (Dylox, Proxol); (3) hexazinone (Velpar, Pronone), (4) aquatic herbicides in the State of Maine; ~~and~~ (5) plant-incorporated protectants; (6) neonicotinoids (Dinotefuran, Clothianidin, Imidacloprid, Thiamethoxam); and (7) chlorpyrifos (Dursban, Lorsban).

Section 1. ALDICARB (TEMIK®)

The registration of aldicarb (Temik 15G) is subject to the following buffer zone requirements:

- A. Aldicarb (Temik 15G) shall not be applied within 50 feet of any potable water source if that water source has been tested and found to have an aldicarb concentration in the range of one to ten parts per billion (ppb). The 50 foot buffer would be mandatory for one year with a required retesting of the water at the end of the period.
- B. Aldicarb (Temik 15G) shall not be applied within 100 feet of any potable water source if that water source has been tested and found to have an aldicarb concentration in excess of 10 ppb. The 100 foot buffer would be mandatory for one year with a required retesting of the water at the end of this period.

Section 2. TRICHLORFON (DYLOX, PROXOL)

The registration of trichlorfon (Dylox, Proxol) is subject to the following requirements:

- A. Trichlorfon shall only be used for control of subsurface insects on turf.
- B. Prior to application the target pest must be identified and the severity of the infestation must be determined, including the extent of the damage.
- C. Only infested areas shall be treated with trichlorfon. Broadcast treatments of the entire turf area are prohibited.
- D. Following application, the trichlorfon must be watered into the soil with at least ½ inch of water and according to the label directions. The applicator must assure that the appropriate watering will take place prior to re-entry by any unprotected person.

Section 3. HEXAZINONE (VELPAR, PRONONE)

The registration of hexazinone is subject to the following limitations and conditions.

A. Licenses Required

No person shall use or supervise the use of any pesticide containing the active ingredient hexazinone unless they have obtained an applicators license in accordance with 22 M.R.S. §1471-D.

Section 4. AQUATIC HERBICIDES

The registration of pesticides for which there is an aquatic herbicide use on the product label shall be subject to the following limitations and conditions.

A. Board Publication of List

The Board of Pesticides Control will publish by May 23, 2003 and by March 15th of each year thereafter a list of herbicide products registered in Maine for which the manufacturer has verified that there is an aquatic use on the pesticide label. Based on available information, the Board may exempt from this list pesticides that it determines are not for use in the control of aquatic vegetation. Pesticides labeled solely for use in aquariums and antifouling paints, are specifically exempt from this list.

B. Licenses Required

- I. Unless exempted under Chapter 41, Section 4 (B) (III), no person shall purchase, use or supervise the use of any aquatic herbicides identified on the Board's annual listing unless they have obtained a private or commercial pesticide applicator's license from the Board.
- II. No person shall:
 - a. Distribute any aquatic herbicides identified on the Board's annual listing without a restricted use pesticide dealer's license from the Board; or
 - b. Unless exempted under Chapter 41, Section 4 (B) (III), distribute any aquatic herbicides identified on the Board's annual listing to any person who is not licensed as a private or commercial applicator by the Board.
- III. Registered herbicides containing only the active ingredients erioglaucline (Acid Blue 9 or FD&C Number 1, CAS Registry No. 1934-21-0) and/or tartrazine (Acid Yellow 23 or FD&C Yellow Number 5, CAS Registry No. 2650-18-2 (trisodium salt) or 3844-45-9 (triammonium salt)) are exempt from the applicator licensing requirements described in Chapter 41, Section 4 (B) (I) and Chapter 41, Section 4 (B) (II) (b).

C. Disclosure

The Board will make a disclosure form available to dealers distributing any aquatic herbicides identified on the Board's annual listing. The Board requests that dealers present to customers the disclosure form that advises purchasers that, (1) an aquatic discharge license must be obtained from the Maine Department of Environmental Protection before any application may be made to any surface waters of the State as defined in 38 M.R.S.A. Section 361-A(7) including any private ponds that may flow into such a body of water at any time of year, (2) that Best Management Practices developed jointly by the Board and the Maine Department of Environmental Protection on the use of aquatic herbicides are available.

D. Records and Reporting

Dealers distributing any aquatic herbicides identified on the Board's annual listing shall keep records of such sales and provide reports to the Board as described for restricted use pesticides in Chapter 50, "Record Keeping and Reporting Requirements."

E. Use of Best Management Practices

Aquatic herbicides applied to private ponds and not subject to an aquatic discharge permit may only be applied consistent with Best Management Practices developed jointly by the Board and the Maine Department of Environmental Protection.

Section 5. PLANT-INCORPORATED PROTECTANTS

The registration, distribution and use of plant-incorporated protectants are subject to the following limitations and conditions:

A. Definitions

"Plant-incorporated protectant" means a pesticidal substance that is intended to be produced and used in a living plant, or in the produce thereof, and the genetic material necessary for the production of such a pesticidal substance.

B. License Required

No person shall distribute any plant-incorporated protectant without either a general use pesticide dealer license or a (restricted or limited use) pesticide dealer license from the Board.

C. Dealer Requirements

Dealers distributing plant-incorporated protectants are subject to the following requirements:

- I. General use and (restricted or limited use) pesticide dealers shall notify the Board of their intent to distribute plant-incorporated protectants on all initial license and license renewal application forms provided by the Board.
- II. General use and (restricted or limited use) pesticide dealers shall maintain sales records showing the list of the names and addresses of all purchasers of plants, plant parts or seeds containing plant-incorporated protectants. These records must be made available to representatives of the Board for inspection at reasonable times, upon request, and must be maintained for two calendar years from the date of sale.
- III. Any general use and (restricted or limited use) pesticide dealer who discontinues the sale of plant-incorporated protectants shall notify the Board in writing and shall provide the Board, upon request, with all records required by Section 5(C)II of this chapter.

D. Grower Requirements

- I. All users of plant-incorporated protectants shall maintain the records listed below for a period of two years from the date of planting. Such records shall be kept current by recording all the required information on the same day the crop is planted. These records shall be maintained at the primary place of business and shall be available for inspection by representatives of the Board at reasonable times, upon request.
 - a. Site and planting information, including town and field location, a map showing crop location and refuge configuration in relation to adjacent crops within 500 feet that may be susceptible to cross-pollination;
 - b. Total acres planted with the plant-incorporated protectant and seeding rate;
 - c. Total acres planted as refuge and seeding rate;
 - d. Detailed application information on any pesticide applied to the refuge as described in Section 1(A) of Chapter 50, "Record Keeping and Reporting Requirements"; and
 - e. Planting information for each distinct site including:
 - i. date and time of planting; and
 - ii. brand name of the plant-incorporated protectant used.
- II. There are no annual reporting requirements for growers.

E. Product-Specific Requirements

- I. Requirements for plant-incorporated protectant corn containing *Bacillus thuringiensis* (Bt) protein and the genetic material necessary for its production.
 - a. Prior to planting plant-incorporated protectant corn containing any *Bacillus thuringiensis* (Bt) protein and the genetic material necessary for

its production, the grower must have completed a Board-approved training course and possess a valid product-specific training certificate.

- b. Product-specific training certificates shall be issued following each Board-approved session. The certificates will remain valid until December 31 of the third year after issuance.
 - c. Non-Bt-corn growers whose crops are or will be located within 500 feet of a prospective Bt-corn planting site can request that the Bt-corn grower protect the non-Bt-corn crop from pollen drift.
 - i. the request must be made prior to planting of the Bt-corn crop;
 - ii. the request must identify the non-Bt-corn crop to be protected; and
 - iii. the growers may agree on any method for protection but, if an agreement cannot be reached,
 - 1. the Bt-corn grower must plant any refuge required by the Bt-corn grower agreement, grower guide or product label in a configuration that provides maximum protection from pollen drift onto the adjacent non-Bt-corn crop; or
 - 2. if no refuge is required, the Bt-corn grower shall maintain at least a 300-foot Bt-corn-free buffer to non-Bt-corn crops.
 - d. Bt-corn growers are encouraged to follow all best management practices developed by the Board or the Department of Agriculture, Conservation and Forestry.
- II. Dealers distributing Bt-sweet corn shall only sell the seed in quantities large enough to plant one acre or more.

F. **Confidentiality**

Any person providing information to the Board in connection with the record-keeping and reporting requirements of Section 5 of this chapter may designate that information as confidential in accordance with 7 M.R.S.A. §20.

Section 6. NEONICOTINOIDS (DINOTEFURAN, CLOTHIANIDIN, IMIDACLOPRID, OR THIAMETHOXAM)

The registration of pesticides containing dinotefuran, clothianidin, imidacloprid, or thiamethoxam for which there is an outdoor ornamental plant or turf use on the product label shall be subject to the following limitations and conditions.

A. Definitions

“Invasive Invertebrate Pests” means any invertebrate species, including its eggs or other biological materials capable of propagating that species, that does or is likely to cause economic or environmental harm or harm to human health and meets one or more of the following criteria:

- a. federally or state regulated;
- b. non-native or not originating from this eco-region;
- c. native or non-native vectors of plant diseases;
- d. native pests that have become highly destructive due to climate change or ecosystem factors

“Ornamental Plants” means shrubs, trees and related vegetation, excluding mown turf and lawn, in and around residences.

B. Board Publication of Product List

The Board of Pesticides Control will publish by X 2022 and by March 15th of each year thereafter a list of insecticide products containing dinotefuran, clothianidin, imidacloprid, or thiamethoxam registered in Maine for which the manufacturer has verified that there is an outdoor ornamental plant or turf use on the pesticide label. Based on available information, the Board may exempt from this list pesticides that it determines are not for use in the control of outdoor ornamental plants or turf. Pesticides labeled solely for use in preserving wood, managing indoor pests, managing structural pests within five (5) feet of a human dwelling, and treating pets are specifically exempt from this list.

C. Licenses Required

- I. No person shall purchase, use or supervise the use of any pesticides containing dinotefuran, clothianidin, imidacloprid, or thiamethoxam identified on the Board's annual listing unless they have obtained a private or commercial pesticide applicator's license from the Board.
- II. Unless exempted under Chapter 41, Section 6 (B) (IV) no person shall purchase, use or supervise the use of any pesticides containing dinotefuran, clothianidin, imidacloprid, or thiamethoxam in outdoor residential landscapes to include ornamental plants and turf.
- III. Distribute any pesticides containing dinotefuran, clothianidin, imidacloprid, or thiamethoxam identified on the Board's annual listing without a restricted use pesticide dealer's license from the Board.
- IV. Registered pesticides containing dinotefuran, clothianidin, imidacloprid or thiamethoxam and identified on the Board's annual listing are exempt from the prohibition of use described in Chapter 41, Section 5 (B) (II) where used for management of an invasive invertebrate pest of ornamental plants:

D. Records and Reporting

Dealers distributing any pesticides containing dinotefuran, clothianidin, imidacloprid or thiamethoxam identified on the Board's annual listing shall keep records of such sales and provide reports to the Board as described for restricted use pesticides in Chapter 50, "Record Keeping and Reporting Requirements."

This section becomes effective January 1, XXX.

Section 7. CHLORPYRIFOS (DURSBAN, LORSBAN)

The registration of chlorpyrifos (Dursban, Lorsban) is subject to the following limitations and conditions.

- A. No person shall use or supervise the use of any pesticide containing the active ingredient chlorpyrifos unless they have obtained a private or commercial applicator's license from the Board, possess the pesticide in the State before January 1, 2022, and obtain a temporary use authorization permit from the Board.
- B. Permit applications shall be made on such forms as the Board provides and shall include at least the following information:
- I. The name, address and telephone number of the applicant;
 - II. The brand name of the pesticides to be applied;
 - III. The date on which the pesticides were purchased;
 - IV. The approximate quantity of the pesticides possessed; and
 - V. The purpose for which the pesticide application(s) will be made.
- C. Within 30 days after a complete application is submitted, the Board or its staff shall issue a permit if:
- I. The permit application is received prior to December 31, 2022;
 - II. The applicant possesses a valid pesticide applicator license issued by the State;
 - III. The pesticides proposed for use were purchased prior to January 1, 2022;
- 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 procedures described in their permit 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.

STATUTORY AUTHORITY: 5 M.R.S.A. §§ 8051 *et seq.*
7 M.R.S.A. §§ 601-610
22 M.R.S.A. §§ 1471-A, 1471-B, 1471-C, 1471-D, 1471-M

EFFECTIVE DATE:
March 8, 1981 (Captan)

AMENDED:
May 7, 1981 (Trichlorfon)
January 2, 1984 (Aldicarb)
May 8, 1988 (Trichlorfon)
August 5, 1990 (Captan)
August 17, 1996 (Hexazinone)
October 2, 1996

EFFECTIVE DATE (ELECTRONIC CONVERSION):
March 1, 1997

AMENDED:
May 7, 1997 - Section 3(B)(II)

CONVERTED TO MS WORD:
March 11, 2003

AMENDED:
May 12, 2003 - Section 4 added

NON-SUBSTANTIVE CORRECTIONS:
June 24, 2003 - summary only

AMENDED:
February 2, 2004 - Section 4, 1st paragraph and sub-section A, filing 2004-31
April 30, 2007 – filing 2007-154
February 3, 2008 – filing 2008-36
July 16, 2009 – filing 2009-253 (final adoption, major substantive)
May 3, 2012 – filing 2012-99 (final adoption, major substantive)

CORRECTIONS:
February, 2014 – agency names, formatting

AMENDED:
December 9, 2014 – Section 3, filing 2014-283

Surveillance for current-use pesticides in Maine's freshwater resources along a population gradient.

Results of 2019 environmental sampling project.

October 2021

Prepared by Pamela J. Bryer, Ph.D | Pesticides Toxicologist

Maine Board of Pesticides Control

Department of Agriculture, Conservation & Forestry

Executive Summary

Surface waters around urban areas are frequently degraded due to non-point source pollutants. One aspect of this contamination originates from the use of pesticides, both inside and outside of the home. While Maine is a rural state, many of our towns and cities were built alongside rivers, placing these aquatic resources at risk for contamination. Recent work elsewhere has demonstrated greater numbers of pesticide detections in areas with higher concentrations of people.

We surveyed the rivers and streams of 10 cities in Maine during the summer of 2019 for the presence of pesticides. We collected grab samples of water and sediment as well as deploying a passive sampler in the water column of each city's major river. The population of the cities spanned from 7,000 to 91,000 residents and were distributed across the state.

We found detectable levels of pesticides in each city. We found greater variety of pesticide types in areas with more people. Biddeford was the location with the greatest number of pesticides where 22 pesticide types were found. Portland, Bangor, and Lewiston-Auburn were close behind with 18 pesticide types found at each. At the other end of the spectrum Ellsworth, Farmington, and Presque Isle all had either ten or eleven pesticide types present. In the sediments the pyrethroid bifenthrin was found in eight out of ten locations.

In several locations pesticide concentrations were above threshold values, indicating negative ecological changes are predicted to start occurring at those sites. The two pesticides exceeding threshold values were bifenthrin in sediment and imidacloprid in water. The locations of these exceedances should have follow up re-sampling to verify the patterns found and more fully understand the scope of the issue.

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Introduction

Maine is a largely rural state with low relative acreage in agriculture. Current national data point to residential and agricultural areas as the two largest contributors to current-use pesticide burdens in surface water. Insecticide contamination is found to predominate in residential areas whereas herbicide contamination is predominantly found in association with agricultural areas (VanMetre et al. 2018). Due to the generally low potential for contamination, Maine is infrequently included in national-scale assessments of current-use pesticides in surface waters and its pesticide distribution patterns in the state are relatively undescribed.

Current-use pesticides tend to have short persistence in the environment which adds to the difficulty in comprehensive sampling programs being able to accurately determine pesticide contamination trends. Approaches to capture current-use pesticide occurrences include: high frequency sampling, snapshot sampling, targeted sampling, and passive sampling. This project could not rely on targeted sampling because we are attempting to capture a complete picture of all pesticide uses and thus knowing when and where pesticides are used becomes impossible. High-frequency sampling is ideal for capturing seasonal fluctuations in current-use pesticide concentrations; however, high-frequency sampling is expensive. The costs for daily or weekly samples taken across our ten locations for the summer season would add up to hundreds of thousands of dollars. The ME BPC typically relies on snapshot sampling (single samples taken in many locations at once) in order to maximize coverage per budget constraints. Passive sampling is a newer and growing technology for environmental sampling. Passive samplers are devices deployed for long periods of time, around 30 days, which collect and integrate information the entire time they are deployed. It is possible to detect the presence of chemicals that occur at lower concentrations or shorter durations because of the longer exposure for the sampling device.

In 2019, the Maine Board of Pesticides Control (BPC) surveyed ten river locations spread across the state in order to establish general patterns of current-use pesticide occurrences. Locations were selected in order to capture the differences in current-use pesticide occurrence across range of population densities. In addition to our traditional grab samples, passive samplers were deployed in the rivers for approximately one month in order to compare the passive sampling results to our traditional grab sampling program.

Objectives of this study were to:

- 1) Establish patterns of current-use pesticides in surface water
- 2) Determine usefulness of passive sampling augmentation to our sampling efforts

Methods

Site selection

Maine's larger cities and towns tend to be situated on water, mostly rivers. We categorized ten cities by population, based on capturing a range of population sizes with the intention to have locations distributed across the state. Spreading sites across the state creates a database that is more representative of the state as a whole. Figure 1 shows the ten locations selected, city population, and corresponding river names.

Specific sampling sites were selected based on access, the proximity of the passive sampler to corresponding grab and sediment sampling sites, and security of the passive sampler. Deployment of passive samplers in the Kennebec, Androscoggin, and Union Rivers required access to boats. Site conditions in Waterville, Auburn-Lewiston, and Sanford required sampling down river at the next available point of access. Sites were located below wastewater treatment plants. Some cities lacked streams or streams located above the river sample sites. A storm culvert in Ellsworth was selected for sampling because it accepts water from the downtown area, its proximity to the river, and the only input to the river with water other than Card Brook.

Surface water sampling

At each city location, a variety of samples were taken. Grab samples from two tributary streams upstream of the passive sampler location were collected. In all, grab samples of water were collected from nineteen streams, one storm drain, and each of the ten rivers halfway through the month-long sampling time used by the passive sampler. Grab samples were also collected from each river at deployment and retrieval of the passive sampler.

Surface water samples were collected into 950 ml amber, glass bottles with a Teflon-lined cap, certified as pre-cleaned for the collection pesticides. Bottles were held beneath the water's surface at the river's edge. If it was possible to collect the sample from farther out from the shore, such as wading or from a dock, samples were taken over the deepest water practicable. Glyphosate samples were taken at the same time in 120 ml polypropylene sampling bottles. Detailed notes of the location during sampling were taken and are available upon request.

Sediment sampling

Sediment samples were composites produced on-site. Briefly, the top 3 cm of sediment was collected randomly within a 50 ft segment along the water's edge. The sediment was homogenized to blend it uniformly, and a portion placed into the 1-quart metal can. A second small sediment sample was taken for organic carbon and particle size analysis.

Passive sampling

Passive sampling was conducted using POCIS (polar organic chemical integrative sampler) samplers. The POCIS sampler is a solid phase sorbent material (Oasis HLB) surrounded by thin polyethersulfone membranes. This resin predominantly absorbs polar chemicals or freely dissolved chemicals with octanol-water partitional coefficients less than three. The POCIS samplers were deployed with metal housings rented from Environmental Sampling Technologies, Inc., St. Joseph, MO 64501. Housings were emplaced to float two to three feet deep in the water column using a weighted buoy system or attached to dock supports.

Passive sampling required a tremendous input of time and collaboration with Casco Bay Estuary, the Maine Department of Environmental Protection (DEP), two Maine game wardens, a harbor master, dam owner, two municipal waste water treatment facilities, and a private citizen to deploy the samplers. The first passive sampler was placed August 6, 2019 and the last passive sampler was removed September 12, 2019.

Duplicate frequency and field blanks

For both sediment and grab samples duplicates were taken on a one in twenty basis such that every 100 samples requires the collection of 5 field blanks.

Ten passive sampling housings were deployed in the study, each housing contained three replicates. The reported concentrations are averages of the three replicates. In addition, one POCIS resin sampler was dedicated as a trip blank and one as a control which remained in an in-house freezer. At each location the canister holding the trip blank was opened and exposed to the air while the deployed sampler was emplaced or removed, then it was carefully repackaged. The laboratory was sent several blank samplers to serve as laboratory blanks and for method development.

Sample storage and transfer

Following collection, samples were placed in coolers with ice and transferred to 0°C freezers. Frozen samples were shipped, on ice, by overnight delivery to the laboratory for analysis.

Laboratory analyses

Sediment characterization

The University of Maine Analytical Laboratory, Orono, Maine, categorized the sediment samples for total organic carbon and particle size distribution. Total organic carbon was run by thermal partitioning and combustion analysis (EPA 440.0) at 1,350°C. Coarse fragments (> 2 mm) were measured gravimetrically by sieving the entire sample. Sand, silt, and clay were run after overnight dispersion in Calgon solution. Clay was determined by the hydrometer method. Sand was determined gravimetrically after wet sieving. Silt is calculated as the remainder of the

sample. Particle size categories are from the USDA. Results are presented as percent in the dried sample. Sand, silt, clay, and coarse fragments constitute 100% of each sample.

Pesticide active ingredient characterization

The University of Montana Agricultural Laboratory (Helena, MT) performed four separate analyses: a multi-residue panel for 102 analytes on the surface water samples, glyphosate on the surface water samples, a multi-residue panel of 102 analytes on the POCIS resin, and a 21-analyte panel of pyrethroids on the sediment samples. The surface water and POCIS samples (after extraction as per EST Inc. protocol) were processed following the Montana Department of Agriculture's "Universal Method for the Determination of Polar Pesticides in Water Using Solid Phase Extraction and Liquid Chromatography/Mass Spectrometry/ Mass Spectrometry" procedures. POCIS results are reported as ng/POCIS and each of the three POCIS resins are averaged. Passive sampling results are reported as presence/absence. Rate sampling conversions were not attempted on the results due to the lack of available rate sampling values for many current use pesticides. The sediment samples were processed following the Montana Department of Agriculture's "Determination of Pyrethroids in Sediment Using Solid Phase Extraction and GC/MS/NCI and /or GC/MS/MS E1" PYR_SI, Revision 2: January, 2014 methodology.

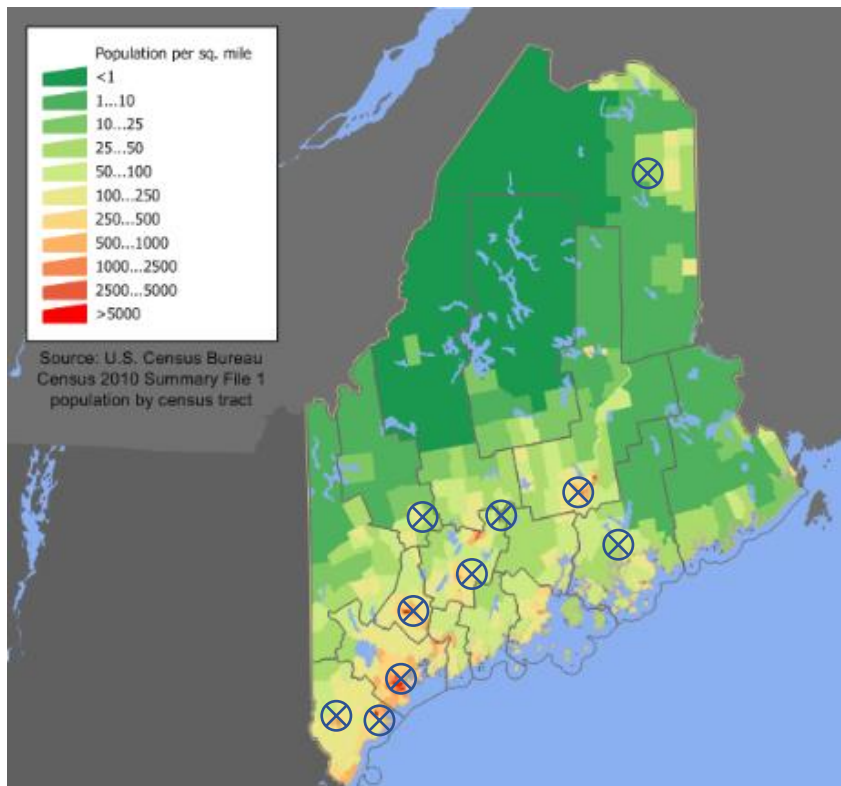
Complete lists of all the analytes, and their respective reporting limits, included in the above chemical assays are available in Appendix 1.

Budget

This work was funded by an EPA Region 1 grant that typically supports several BPC functions under the FIFRA Cooperative Agreement.

Statistics

Simple summary statistics and linear regressions were performed with Microsoft 365 Excel Data Analysis. Simple linear regression was used to test if human population significantly predicted number of pesticide detections, in addition to, the number of unique pesticide types.



The circles with the 'X' indicate locations included in this study.

Population Centers*	Waterbody	Population†
Portland / South Portland	Fore River	91,196
Lewiston-Auburn (Durham)	Androscoggin River	59,647
Bangor / Brewer / Orono (Hampden)	Penobscot River	42,521
Biddeford / Saco	Saco River	39,759
Sanford	Mousam River	20,798
Augusta	Kennebec River	19,136
Waterville (Sidney)	Kennebec River	15,722
Presque Isle	Aroostook River	9,692
Ellsworth	Union River	7,760
Farmington	Sandy River	7,741

*Locations in parentheses indicate actual sampling location.

†Population data from 2010 US Census

Figure 1. Sampling locations and associated river names. Map displays populations density across the state in terms of residents per square mile.

Results

Surface water

All locations had at least one current-use pesticide detected. Grab sampling resulted in an overall lower detection rate. POCIS data indicate atrazine, imidacloprid, metolachlor, and prometon contamination is widespread in Maine, occurring in almost every POCIS sample. Table 1 contains summary data for surface water grab sample detections, it displays the total number of occurrences and value of each detection. Table 2 contains summary data for POCIS generated current-use pesticide detections, it displays the type of pesticides found in each location. The complete suite of all analytes tested and their respective reporting limits are listed in Appendix 1.

Surface water grab samples

Forty-six surface water grab samples were sent to the laboratory and each was analyzed for 102 unique current-use pesticides and their degradation products resulting in 4,692 individual tests. From that constellation of 4,692 tests performed there were 200 unique detections. The 102 possible analytes represent a total of 77 unique pesticide product active ingredients included in these analyses. Twenty-five of the test analytes included in the analyses are the breakdown products of 77 parent active ingredients. Twenty-eight current-use pesticide product active ingredients were identified from grab sampling. The most commonly occurring analytes include (number in parentheses indicates number of times it was detected): atrazine and degradates (48), metolachlor and degradates (31), imazapyr (16), imidacloprid (14), prometon (13), and 2,4-D (13). Other active ingredients detected less frequently were: bentazon, bromacil, diuron, fipronil, hexazinone, imazamethabenz acid, imazapic, indaziflam, isoxaben, MCPA, MCPP, metalxyl, methomyl, metsulfuron methyl, propiconazole, pyrasulfotole, sulfometuron methyl, tebuconazole, tebuthiuron, terbacil, tetraconazole, and triclopyr.

Of the 28 current-use products identified by grab sampling 19 of them also appear as active ingredients on the state's Groundwater Advisory List. One product, imazamethabenz acid, does not appear to be included in any products currently or formerly registered in Maine. The majority of the 28 current-use products identified are herbicides with 3 of the detections from insecticides and 4 from fungicides.

No strong correlation can be seen between city population and the number of pesticide detections (Figure 2) There was no significant relationship between the city population size and the number of pesticide detections ($F_{(1,8)} = 0.546$, $P = 0.481$). The unexpectedly high number of detections in Ellsworth is likely due to a sample location that was at a storm drain, removing that one sample reduced the detections from 31 to 16.

Table 1. Current-use pesticides detected in Maine rivers with grab sampling during summer 2019. Only detections are shown. All units µg/L (ppb). 'Q' indicates a detection adequate for identification but not sufficient for quantification.

	Augusta					Bangor				
Field ID	190826METO 6A	190812METO 2A	190909LRSO 3A	190826METO 5A	190826METO 7A	190822METO 1A	190806NJTO 1A	190822METO 2A	190822METO 3A	190904METO 1A
Lab ID	AB91982	AB91809	AB92268	AB91981	AB91983	AB91934	AB91740	AB91935	AB91936	AB92118
2,4-D						Q			Q	
Atrazine	0.0026	Q		Q		0.0081		Q		
DEA		Q		Q	Q	Q			Q	
HA	Q				Q	Q			0.0064	
Bentazon										
Bromacil										
Diuron									Q	
Fipronil									Q	
Hexazinone										
Imazamethabenz acid										
Imazapic									Q	
Imazapyr	0.0038				Q	0.0035		Q	0.019	
Imidacloprid	0.0039				0.0059				0.0056	
Indaziflam										
Isoxaben						0.0049				
MCPA									0.019	
MCPP										
Metalaxyl										
Methomyl										
Metolachlor						Q				
Metolachlor ESA	Q	0.012	0.011	0.011	Q	0.049		Q		Q
Metolachlor OA						Q				
Metsulfuron methyl									Q	
Prometon	Q				0.0011				0.001	
Propiconazole										
Pyrasulfotole										
Sulfometuron methyl										
Tebuconazole									Q	
Tebuthiuron										
Terbacil										
Tetraconazole										
Triclopyr									0.047	
Total Detections	19					26				

Table 1. Continued

Field ID	Biddeford-Saco					Ellsworth				
	190823METO 2A	190823METO 1A	190823METO 3A	190906ARP 01A	190808METO 1A	190820HDNO 3A	190806HDNO 1A	190820HDNO 1A	190820HDN 02A	190905HDNO 1A
Lab ID	AB91941	AB91940	AB91942	AB92121	AB91807	AB91862	AB91739	AB91860	AB91861	AB92119
2,4-D		0.0094	0.016		Q			0.0098		
Atrazine								0.0074	0.0023	
DEA					Q			0.0047	0.0018	
HA		Q				Q		0.0066	0.0055	
Bentazon								0.078		
Bromacil										
Diuron										
Fipronil									Q	
Hexazinone						0.049	0.0025			0.0021
Imazamethaben z acid								Q		
Imazapic		Q	Q						0.0037	
Imazapyr		0.012	0.0037			0.0036			0.01	
Imidacloprid	0.0024	0.007	0.11		0.0021				0.0022	
Indaziflam		Q								
Isoxaben								Q		
MCPA										
MCPP		0.005	0.0049							
Metalaxyl										
Methomyl										
Metolachlor										
Metolachlor ESA	0.027			0.023	0.025			0.11	Q	
Metolachlor OA								Q		
Metsulfuron methyl										
Prometon		0.0031	0.0021					Q	0.0035	
Propiconazole								Q		
Pyrasulfotole								Q		
Sulfometuron methyl		0.004							0.0041	
Tebuconazole		Q						Q		
Tebuthiuron								0.0013		
Terbacil						Q				
Tetraconazole								Q		
Triclopyr										
Total Detections	23					31				

Table 1. Continued

	Farmington					Lewiston-Auburn				
Field ID	190815METO 1A	190912LR50 1A	190828METO 1A	190828METO 2A	190828METO 3A	190813METO 1A	190827METO 3A	190911ARPO 1A	190827METO 1A	190827METO 2A
Lab ID	AB91853	AB92276	AB92000	AB92001	AB92002	AB91815	AB91972	AB92271	AB91984	AB91971
2,4-D									0.048	
Atrazine		Q				Q	Q		Q	
DEA						Q	Q		Q	
HA									Q	
Bentazon										
Bromacil										
Diuron										
Fipronil										
Hexazinone	0.0024									
Imazamethabenz acid										
Imazapic									Q	
Imazapyr									0.016	
Imidacloprid						Q		0.0097		
Indaziflam										
Isoxaben										
MCPA										
MCPP									0.0085	
Metalaxyl										
Methomyl										
Metolachlor										
Metolachlor ESA						0.024	0.047	0.02	Q	0.019
Metolachlor OA							Q			
Metsulfuron methyl										
Prometon				Q					0.0039	
Propiconazole										
Pyrasulfotole										
Sulfometuron methyl									0.003	
Tebuconazole									0.02	
Tebuthiuron										0.0017
Terbacil										
Tetraconazole										
Triclopyr										
Total Detections	3					23				

Table 1. Continued

Field ID	Portland					Presque Isle				
	190821ARPO 2A	190821ARPO 3A	190807METO 1A	190821ARPO 1A	190906ARPO 2A	190814METO 1A	190910KRBO 1A	190828KRBO 1A	190828KRBO 3A	190828KRBO 1A
Lab ID	AB91903	AB91904	AB91741	AB91902	AB92122	AB91818	AB92269	AB92003	AB92005	AB92004
2,4-D	Q	0.059								
Atrazine			Q							Q
DEA										Q
HA	Q	Q							Q	
Bentazon										
Bromacil		0.013								
Diuron	Q	0.01								
Fipronil										
Hexazinone									Q	Q
Imazamethabenz acid										
Imazapic	0.0032	Q								
Imazapyr	0.0035	0.011					Q		0.014	0.0078
Imidacloprid		0.0081								
Indaziflam		Q								
Isoxaben						Q				
MCPA		Q								
MCPP		0.02								
Metalaxyl										Q
Methomyl									0.016	
Metolachlor										
Metolachlor ESA									0.0093	0.011
Metolachlor OA										
Metsulfuron methyl										
Prometon	0.0011	0.0011							0.01	0.0019
Propiconazole										
Pyrasulfotole										
Sulfometuron methyl		Q							0.0042	
Tebuconazole	0.028									
Tebuthiuron										
Terbacil										
Tetraconazole										
Triclopyr										
Total Detections	20					16				

Table 1. Continued

Field ID	Sanford					Waterville				
	190827MET04 A	190813MET 03A	190827MET 06A	190911ARPO 2A	190827MET 05A	190812MET 01A	190826MET 04A	190909LR50 1A	190826MET0 2A	190826MET 01A
Lab ID	AB91973	AB91817	AB91975	AB92272	AB91974	AB91808	AB91980	AB92266	AB91978	AB91977
2,4-D		0.018	0.019	0.0093					0.04	
Atrazine						Q	Q	Q	Q	Q
DEA						Q	Q		Q	Q
HA									Q	Q
Bentazon										
Bromacil										
Diuron		0.0078	0.0097	0.015						
Fipronil		0.0027	0.0029	0.0029						
Hexazinone										
Imazamethab enz acid										
Imazapic					Q					
Imazapyr									Q	
Imidacloprid		0.007	0.0074		0.0026					
Indaziflam										
Isoxaben		Q		0.011						
MCPA									0.0055	
MCPP									0.0082	
Metalaxyl										
Methomyl										
Metolachlor										
Metolachlor ESA	0.01					0.012	0.011	0.016	0.0077	0.028
Metolachlor OA										
Metsulfuron methyl										
Prometon										
Propiconazole										
Pyrasulfotole										
Sulfometuron methyl										
Tebuconazole										
Tebuthiuron										
Terbacil										
Tetraconazole										
Triclopyr										
Total Detections			16					20		

Table 2. Current-use pesticides detected in Maine rivers with POCIS passive samplers. Checkmarks indicate a detection (in at least one of the three replicates). Only analytes with detections are shown; complete list of tested analytes and reporting limits are listed in Appendix 1.

Detected Analyte	Augusta	Bangor	Biddeford -Saco	Ellsworth	Farmington	Lewiston- Auburn	Portland	Presque Isle	Sanford	Waterville
2,4-D			X						X	X
Alachlor ESA			X							
Atrazine	X	X	X	X	X	X	X	X	X	X
Deethyl atrazine	X	X	X	X	X	X	X	X	X	X
Hydroxy atrazine	X	X	X	X	X	X		X	X	X
Azoxystrobin	X	X	X	X	X	X	X	X	X	X
Clothianidin						X			X	
Dimethenamid			X							
Diuron	X	X	X	X	X	X	X		X	X
Fipronil	X	X	X	X	X	X	X		X	X
Fipronil sulfone									X	
Fluroxypyr					X					
Hexazinone	X	X	X	X		X	X	X		X
Imidacloprid	X	X	X		X	X	X		X	X
Indaziflam		X	X				X			X
MCPP		X	X				X			
Metalaxyl								X		
Methomyl										
Methoxyfenozide										
Metolachlor	X	X	X			X				X
Metolachlor ESA	X	X	X		X	X	X	X	X	X
Metolachlor OA			X							
Prometon	X	X	X	X	X	X	X	X	X	X
Propiconazole	X	X	X			X	X		X	X
Simazine	X	X	X			X	X	X	X	X
Sulfometuron methyl	X	X	X	X		X	X	X		X
Tebuconazole	X	X	X	X	X	X	X		X	X
Tebuthiuron			X			X	X			X
Total Unique Analytes	15	18	22	10	11	18	16	10	15	18

Passive Sampling

Passive sampling produced data from a possible combination of 3,264 possible tests (number of analytes available versus 32 samples processed). Of the possible 102 analytes, 77 unique current-use pesticide products were represented (after combining metabolites together with their parent). There were 439 total detections from this pool of 3,264 combinations.

When metabolites are added back in with the parent compound and the total number of occurrences are combined, the passive sampling results can be described as follows: no study site major river had fewer than eight current-use pesticides; the maximum number of pesticides found in a sample was 18; the average number of current-use pesticide products in each sample was 13.

Current-use pesticide products and their metabolites occurring in 90% or more of the samples include: atrazine and its breakdown product deethyl atrazine, azoxystrobin, diuron, fipronil, metolachlor ESA, prometon, and tebuconazole. Runners up that were detected in 50% or more the samples include the above plus: hexazinone, imidacloprid, metolachlor, propiconazole, simazine, and sulfometuron methyl. Less frequently detected current-use pesticides and their breakdown products include: 2,4-D, alachlor ESA, chlothianidin, thiamethoxam, dimethenamid, fipronil sulfone, fluroxypyr, indaziflam, MCPP (mecoprop), metalaxyl, metolachlor OA, tebuthiuron, and tetraconazole.

Passive sampling data presented here only contain presence or absence data. After combining the degradates with the parents, the number of unique pesticide active ingredients can be seen for each city (Figure 3). There was a significant relationship between the city population size and the number of unique pesticides detected ($R^2 = 0.43$, $F_{(1,8)} = 5.9$, $P = 0.041$).

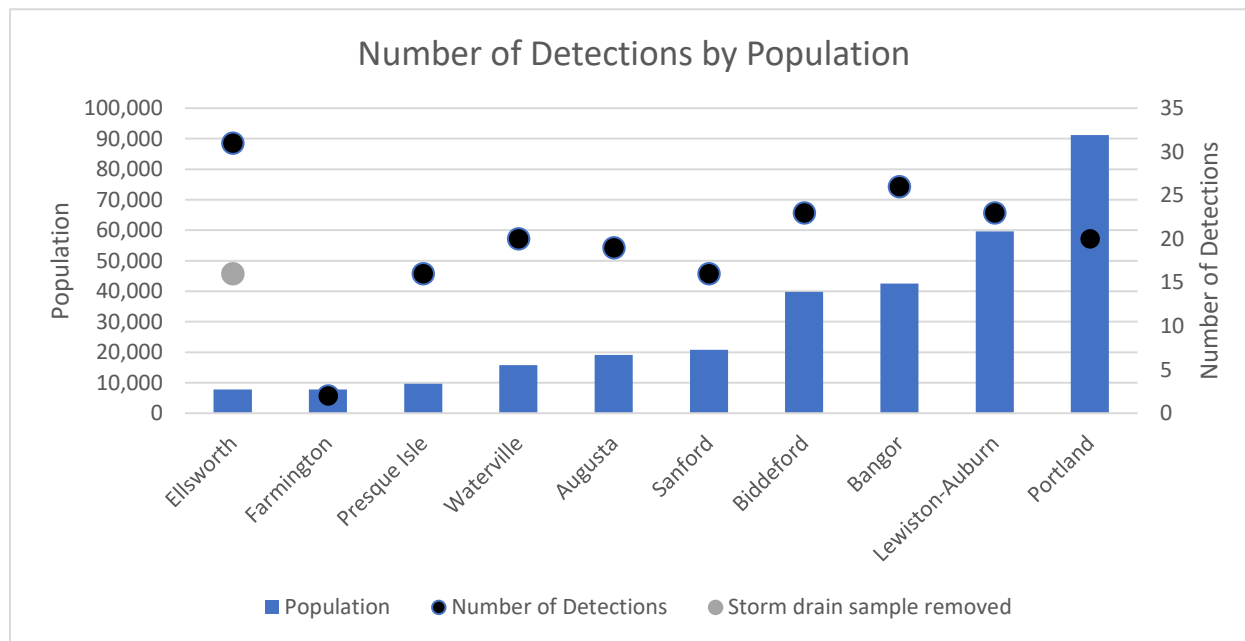


Figure 2. Number of analyte detections in surface water grab samples across the range of population centers. Bars represent the number of residents. Circles represent the number of times all of the samples from a city detected a pesticide. Five samples were taken at each city location. The gray circle represents the Ellsworth totals with a grab sample removed, see text for discussion.

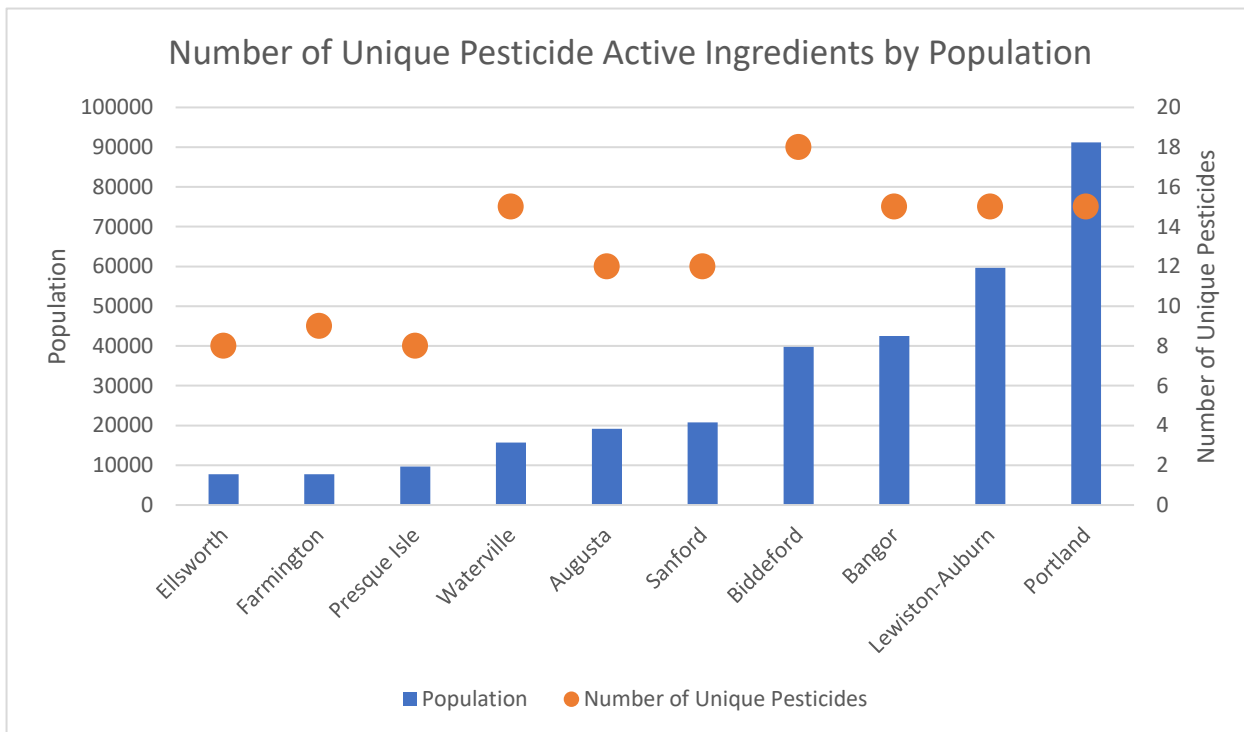


Figure 3. Number of unique pesticide products identified in surface water by passive sampling across the range of population centers. Bars represent the number of residents. Orange circles represent the number of different types of pesticides present. One POCIS sampler was used in each city, where it was deployed for one month.

Glyphosate

No glyphosate residues were detected in any of the locations. The primary breakdown product of glyphosate is AMPA; no AMPA residues were detected. Glufosinate is an herbicide similar to glyphosate requiring the same laboratory preparation as glyphosate. There were no detectable glufosinate residues. The reporting limits for these analyses are listed in Appendix 1.

Sediment

Bifenthrin was detected in eight of ten sediment samples. No other pyrethroids were detected (Table 3). Appendix 2 contains sediment characteristic data, including organic carbon concentrations.

Duplicates and blanks

No field blanks or trip blanks had detectable concentrations of the surveyed pesticides.

Table 3. Sediment sample results assessing pyrethroids and piperonyl butoxide in Maine rivers during summer 2019. Results are reported in ng/g (ppb) on a dry weight basis as well as organic carbon normalized.

	Reporting Limit (ng/g)	Augusta	Bangor	Biddeford	Ellsworth	Farmington	Lewiston-Auburn	Portland	Presque Isle	Sanford	Waterville
Percent TOC		0.73	3.58	0.31	3.93	0.25	0.09	1	0.85	5.23	0.53
Allethrin	0.20										
Bifenthrin	0.045	1.3	0.91	0.46	0.67		0.058	0.23	0.059		0.084
Bifenthrin ng/g-OC		178.1	25.4	148.4	17.0		64.4	23.0	6.9		15.8
Cyfluthrin	0.20										
Cyhalothrin	0.27										
Cypermethrin	0.20										
Deltamethrin	0.40										
Fenpropathrin	0.20										
Fenvalerate	0.13										
cis-Permethrin	0.20										
trans-Permethrin	0.20										
Phenothrin	2.0										
Piperonyl butoxide	2.0										
Prallethrin	0.20										
Resmethrin	2.0										
Tetramethrin	0.14										

Discussion

This project found current-use pesticides are present in Maine waters, a pattern that is consistent with stream data throughout the United States (USGS 2020). There was a significant effect of city population size on the number of different types of pesticide contamination in surface water. Cities with higher population sizes typically had a greater number of different pesticides occurring in their major river. Two of the pesticide active ingredients were present at levels that could threaten aquatic organisms (EPA 2020). Specifically, bifenthrin exceeded the Threshold Effects Concentration of 0.17 $\mu\text{g/g-oc}$ with a concentration of 0.18 $\mu\text{g/g-oc}$ in one city. Imidacloprid exceeded the invertebrate chronic Aquatic Life Benchmark of 0.01 ppb with a concentration of 0.11 ppb. These patterns should be understood relative to the limitations of the current study. Given the small number of samples it is suggested the reader recognize that other natural processes could be the cause for certain patterns observed throughout the current study.

Thresholds

EPA's Aquatic Life Benchmark (ALB) threshold values are intended to serve as a precautionary measure, prompting further investigation. When environmental values equal the ALB for a given taxon it is expected that effects could start to be seen in that population. However, marked species differences to chemicals means that the ecosystem responses cannot be completely predicted based on ALB values alone. Some species will be more or less sensitive to any given chemical, additional studies into ecosystem wide effects are often warranted following the detection of a chemical above its Aquatic Life Benchmark.

Bifenthrin was found in the sediments of eight out of ten study locations. Previous collections of sediment along the Maine coast have also indicated repeated detections of bifenthrin (BPC 2017). Bifenthrin is a commonly used mosquito and tick outdoor residential yard treatment and is additionally used in agriculture. Bifenthrin takes longer than many other current-use pesticides to degrade in the environment. Sunlight effectively degrades bifenthrin, but it is not hydrolyzed by water or biodegraded by microorganisms to any great extent, meaning it tends to be fairly stable and not breakdown when in dark locations that are either wet or dry. Bifenthrin is only slightly soluble in water and is typically only found in sediments, not the overlying water. Predicting toxicity from chemicals displaying this pattern is not straightforward. The bulk of this chemical stays locked-up tightly bound to sediment particles. However, there exists an equilibrium that allows a small amount of the bifenthrin to enter the water column over time. EPA's Aquatic Life Benchmark is an aquatic value, based on concentrations in water, not sediment. The comparison of sediment values to aquatic benchmarks was used to identify potential issues but it does not accurately predict toxicity.

Sediment threshold values, which are similar to the Aquatic Life Benchmark values, have been developed for select pesticides including bifenthrin. Nowell et al. (2016) present an Integrated Threshold Effects Benchmark value of bifenthrin at 0.17 $\mu\text{g/g-oc}$ and an Integrated Likely Effects Benchmark at 0.6 $\mu\text{g/g-oc}$. Exceeding the Likely Effects Benchmark would indicate a high probability of adverse effects and environmental concentrations below the Threshold Effects Benchmark are unlikely to result in adverse effects. After normalizing the bifenthrin values with each site's total organic carbon concentration in the sediments, our study indicates that while bifenthrin is consistently present and it can reach concerning concentrations in some Maine locations. However, the majority of the bifenthrin detections remain

below levels of concern. The mean concentration across all eight sites with bifenthrin detections was 0.06 µg/g-oc, further indicating the relative lack of expected effects on aquatic organisms (values lower than 0.6 µg/g-oc are considered unlikely to result in any adverse effects). However, for one location the concentration of bifenthrin has reached the Threshold Effects Benchmark. Additional sampling in the area is warranted because these results represent only a single sample.

Imidacloprid was found in eight of the ten cities and exceeded the Aquatic Life Benchmark in one city (Biddeford). The highest measured value was 0.11 ppb exceeding the invertebrate chronic Aquatic Life Benchmark of 0.01 ppb. As a highly effective insecticide, imidacloprid is known to be highly toxic to aquatic invertebrates. Other aquatic organisms are unlikely to experience effects from these imidacloprid exposures due to its lower hazard potential to vertebrates and plants. Among samples with imidacloprid detections, the average concentration was 0.013 ppb. Similar to the issue with bifenthrin, the majority of locations would not be expected to be seeing negative effects but there are locations in Maine where the concentration was elevated to a concerning level and additional sampling is needed.

Trends

Of the pyrethroid insecticides, only the longer-lived bifenthrin was found in sediments, however, as with previous trends it is ubiquitously found in most locations. For surface waters, atrazine, imidacloprid, prometon, diuron, fipronil, and metolachlor occur almost ubiquitously. Pervasive occurrence in the environment can arise from pesticide products that degrade quickly but are often replenished or from pesticides that are very persistent by their chemical nature. Surface water testing is also more likely to detect those pesticides with the chemical properties that allow it to dissolve, move, and persist better in water.

This study is limited by the number of samples. We took roughly five surface water samples in each of the ten cities. The samples represented different tributaries as well as the major river in the city. The passive samples (POCIS) and the grab sample of each major river were located downstream of the sampled tributaries. The similarity of detections and between grab samples and POCIS samples were variable. The number of detections counted in the grab samples were varied and did not trend significantly with the city population. However, the passive sampling devices detecting only pesticide presence or absence did link the population size to the number of unique pesticides.

Passive sampling vs. grab samples

Including passive sampling as part of the surveillance increased the number of identified analytes over traditional grab sampling. There were 45 unique detections from the surface water samples between parent compounds and breakdown products. Fifteen of those analyte detections occurred in the passive samplers only. In addition to increasing the number of unique analytes detected, the passive sampling also increased the number of detections for those 30 analytes that were detected via both methods. This increase helped clarify the patterns of distribution for several of the more common analytes. For example, imidacloprid has occurred sporadically in past sampling projects. In the present study, 23% of grab samples and 80% of passive samples contained imidacloprid. The passive sampling result helped to fill gaps in data relative to the more quantitative grab sampling data. Imidacloprid is persistent in soil, the half-life in soil is just under 200 days, meaning it is likely to be detected in soil for up to two and a half years. However, in sunlit water the half-life is about five hours, meaning it could be nondetectable just over one day after application. Passive sampling can catalog chemicals that occur only briefly.

The passive sampling data are not quantitative and do not serve in establishing whether or not the accumulation of the pesticide active ingredients has reached a concentration of concern. The majority of the detections in this study found concentrations many orders below levels known to cause adverse effects; for surface water grab samples there were 2 detections over an Aquatic Life Benchmark from 6,426 tests run in this study, equaling 0.03% of all testing completed. Information on quantity is essential for scenarios where there is concern over the concentration. In Maine, there are relatively low land use burdens, where testing seldom finds concentrations violative of any thresholds, environmental surveys can use passive samplers without significant loss of information. Previous environmental surveys in Maine waters assess only the number of detections because there are seldom enough data for more quantitative analytical approaches.

Surface vs storm water

Surface water is distinct from storm water in that storm water represents only run-off while surface water represents the integration of run-off into the receiving water body. Surface water samples represent the greater portion of typical exposures to pesticides in aquatic habitats. The location of the sampling becomes important as proximity to point sources may potentially change study outcomes. In this study a storm culvert was sampled as a replacement sample site in Ellsworth because there are no streams that run through that city. The storm drain, serving the downtown and residential areas of Ellsworth, contributed to a higher number of detections in Ellsworth and complicates the interpretation of these data. As seen in Figure 2, Ellsworth had the greatest number of detections of all cities in the study despite being a relatively small city. If the culvert data are removed the comparison to other cities is compromised because there are different numbers of samples being compared between cities. With the culvert data removed there is a substantial decrease in the number of detections. If only the number of unique pesticides is tallied, this pattern largely goes away as seen in Figure 3. Storm water sampling is ideal for understanding the total suite and intensity of pollution sources. In this study, the focus was on better understanding the current status of aquatic environments not just the type of pesticides present in runoff.

Conclusions

In this study, we demonstrated that current use pesticides can be found commonly in streams and rivers in the cities of Maine. Cities with larger populations tend to have greater numbers of pesticide types. The detections of pesticides seldom reach concentrations of concern; however, it is possible in some localities. Passive sampling (POCIS) did increase the ability to detect pesticides, however, there was a trade off because of the inability to determine pesticide concentrations reliably with passive sampling. This small data set adds substantially to what is known about current use pesticide contamination of surface waters in Maine. Additional research is needed to better understand this topic.

Contributors

This study was created in collaboration between Mary Tomlinson, Pam Bryer, and Megan Patterson. Curtis Bohlen provided discussions on study design and data presentation. The Board of Pesticides Control (BPC) public policy board also approved the project. The study was organized and conducted by

Mary Tomlinson, with help of the following BPC inspectors Keith Brown, Heidi Nelson, Alex Peacock, Lucien Saucier, and Nate Thompson.

Acknowledgements

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References

Van Metre, P.C., Mahler, B.J., Carlisle, D., and J. Coles. 2018. The Midwest Stream Quality Assessment—Influences of human activities on streams. U.S. Geological Survey Fact Sheet 2017–3087. (<https://doi.org/10.3133/fs20173087>)

USGS 2020. Regional Stream Quality Assessment. <https://webapps.usgs.gov/rsqa/#/>

EPA 2020. US EPA Aquatic Life Benchmarks a Ecological Risk Assessments for Registered Pesticides <https://www.epa.gov/pesticide-science-a-assessing-pesticide-risks/aquatic-life-benchmarks-a-ecological-risk>

BPC 2017. ME BPC Agenda 1/11/2017. Accessible at: <https://www.maine.gov/dacf/php/pesticides/meetings.shtml#jan17>

Nowell, L. H., Norman, J. E, Ingersoll, C. G., and P. W. Moran. 2016. Development and application of freshwater sediment-toxicity benchmarks for currently used pesticides. *Science of the Total Environment* 550: 835-850. (<http://dx.doi.org/10.1016/j.scitotenv.2016.01.081>)

Appendix 1. Complete lists of chemical analyses by media with their respective reporting limits.

Surface water grab samples (* indicates samples over existing thresholds):

Grab sample analyte list		Function
Analyte Name	RL ug/L (ppb)	
2,4-D	0.009	Herbicide
AMBA (mesotrione metab)	0.021	Herbicide
Acetochlor	0.14	Herbicide
Acetochlor ESA	0.02	Herbicide
Acetochlor OA	0.0084	Herbicide
Alachlor	0.11	Herbicide
Alachlor ESA	0.0068	Herbicide
Alachlor OA	0.0068	Herbicide
Aminocyclopyrachlor	0.025	Herbicide
Aminopyralid	0.03	Herbicide
Atrazine	0.0022	Herbicide
Azoxystrobin	0.0052	Fungicide
Bentazon	0.0022	Herbicide
Bromacil	0.0041	Herbicide
Bromoxynil	0.012	Herbicide
Carbaryl	0.014	Insecticide
Chlorpyrifos	0.06	Insecticide
Chlorsulfuron	0.0056	Herbicide
Clodinafop acid	0.013	Herbicide
Clopyralid	0.088	Herbicide
Clothianidin	0.016	Insecticide
Deethyl atrazine	0.0017	Herbicide
Deethyl isopropyl atrazine	0.1	Herbicide
Deisopropyl atrazine	0.04	Herbicide
Dicamba	0.88	Herbicide
Difenoconazole	0.011	Fungicide
Dimethenamid	0.006	Herbicide
Dimethenamid OA	0.0072	Herbicide
Dimethoate	0.0022	Insecticide
Disulfoton sulfone	0.0066	Insecticide
Diuron	0.0053	Herbicide
FDAT (indaziflam metab)	0.0051	Herbicide
Fipronil	0.0024	Insecticide
Fipronil desulfinyl	0.14	Insecticide
Fipronil sulfide	0.08	Insecticide
Fipronil sulfone	0.04	Insecticide
Flucarbazone	0.0024	Herbicide

Flucarbazone sulfonamide	0.0039	Herbicide
Flumetsulam	0.029	Herbicide
Flupyradifurone	0.045	Insecticide
Fluroxypyr	0.035	Herbicide
Glutaric acid	0.03	Fungicide
Hydroxy atrazine	0.004	Herbicide
Halosulfuron methyl	0.01	Herbicide
Hexazinone	0.0015	Herbicide
Imazamethabenz acid metab	0.0025	Herbicide
Imazamethabenz ester	0.001	Herbicide
Imazamox	0.0057	Herbicide
Imazapic	0.003	Herbicide
Imazapyr	0.0035	Herbicide
Imazethapyr	0.004	Herbicide
Imidacloprid	0.0018	Insecticide
Indaziflam	0.002	Herbicide
Isoxaben	0.003	Herbicide
Isoxaflutole	0.13	Herbicide
MCPA	0.0046	Herbicide
MCPP	0.0044	Herbicide
Malathion	0.028	Insecticide
Malathion oxon	0.0024	Insecticide
Metalaxyl	0.0035	Insecticide
Methomyl	0.012	Insecticide
Methoxyfenozide	0.01	Insecticide
Metolachlor	0.024	Herbicide
Metolachlor ESA	0.005	Herbicide
Metolachlor OA	0.042	Herbicide
Metsulfuron methyl	0.01	Herbicide
Pinoxaden metabolite 854	0.0052	Herbicide
Pinoxaden metabolite 204	0.02	Herbicide
Nicosulfuron	0.011	Herbicide
Norflurazon	0.02	Herbicide
Norflurazon desmethyl	0.02	Herbicide
Oxamyl	0.01	Insecticide
Parathion methyl oxon	0.012	Insecticide
Phorate sulfone	0.024	Insecticide
Phorate sulfoxide	0.003	Insecticide
Picloram	0.28	Herbicide
Picoxystrobin	0.0075	Fungicide
Prometon	0.001	Herbicide
Propiconazole	0.01	Fungicide
Prosulfuron	0.005	Herbicide
Pyrasulfotole	0.02	Herbicide
Pyroxsulam	0.013	Herbicide
Saflufenacil	0.01	Herbicide

Simazine	0.0026	Herbicide
Sulfentrazone	0.035	Herbicide
Sulfometuron methyl	0.0025	Herbicide
Sulfosulfuron	0.0054	Herbicide
Tebuconazole	0.014	Fungicide
Tebuthiuron	0.0011	Herbicide
Tembotrione	0.073	Herbicide
Terbacil	0.0048	Herbicide
Terbufos sulfone	0.011	Insecticide
Tetraconazole	0.0039	Fungicide
Thiamethoxam	0.02	Insecticide
Thiencarbazone methyl	0.04	Herbicide
Thifensulfuron	0.022	Herbicide
Tralkoxydim	0.0051	Herbicide
Tralkoxydim acid	0.005	Herbicide
Triallate	0.3	Herbicide
Triasulfuron	0.055	Herbicide
Triclopyr	0.022	Herbicide
Trifloxystrobin	0.02	Fungicide

Surface water grab sample glyphosate:

Grab Samples: Glyphosate	
Analyte Name	RL ug/L (ppb)
AMPA	1
Glyphosate	1
Glyfosinate	1

Surface water POCIS samples:

POCIS sample analyte list	
Analyte Name	RL ng/POCIS
2,4-D	0.45
Acetochlor	6.9
Acetochlor ESA	1
Acetochlor OA	0.42
Alachlor	5.5
Alachlor ESA	2.2
Alachlor OA	0.35
AMBA (mesotrione metab)	1.1
Aminocyclopyrachlor	1.3
Aminopyralid	1.5
Atrazine	0.12
Azoxystrobin	0.24

Bentazon	0.11
Bromacil	0.23
Bromoxynil	0.62
Carbaryl	0.73
Chlorpyrifos	3
Chlorsulfuron	0.3
Clodinafop-propargyl acid	0.7
Clopyralid	4.4
Clothianidin	0.84
Deethyl atrazine	0.088
Deethyl deisopropyl atrazine	5
Deisopropyl atrazine	2.1
Dicamba	44
Difenoconazole	0.49
Dimethenamid	0.31
Dimethenamid OA	0.36
Dimethoate	0.1
Disulfoton sulfone	0.34
Diuron	0.29
Iaziflam metab	0.27
Fipronil	0.12
Fipronil desulfinyl	0.12
Fipronil sulfide	7.1
Fipronil Sulfone	2
Flucarbazone	0.12
Flucarbazone sulfonamide	0.2
Flumetsulam	1.4
Flupyradifurone	3
Fluroxypyr	1.7
Glutaric acid	1.6
Hydroxy atrazine	0.2
Halosulfuron methyl	0.49
Hexazinone	0.084
Imazamethabenz acid metab	0.14
Imazamethabenz ester	0.05
Imazamox	0.31
Imazapic	0.18
Imazapyr	0.18
Imazethapyr	0.22
Imidacloprid	0.1
Iaziflam	0.095
Isoxaben	0.15
Isoxaflutole	6.5
Malathion	1.5
Malathion oxon	0.13
MCPA	0.23

MCPP	0.22
Metalaxyl	0.17
Methomyl	0.32
Methoxyfenozide	0.52
Metolachlor	1.2
Metolachlor ESA	0.25
Metolachlor OA	2.1
Metsulfuron methyl	0.51
Nicosulfuron	0.52
Pinoxaden metab 854	0.27
Pinoxaden metab 204	1
Norflurazon	1
Norflurazon desmethyl	1.1
Oxamyl	0.51
Parathion methyl oxon	0.61
Phorate sulfone	1.2
Phorate sulfoxide	0.15
Picloram	14
Picoxystrobin	0.38
Prometon	0.05
Propiconazole	0.52
Prosulfuron	0.25
Pyrasulfotole	1
Pyroxsulam	0.66
Saflufenacil	0.51
Simazine	0.14
Sulfentrazone	1.8
Sulfometuron methyl	0.13
Sulfosulfuron	0.28
Tebuconazole	0.71
Tebuthiuron	0.056
Tembotrione	3.7
Terbacil	0.24
Terbufos sulfone	0.55
Tetraconazole	0.2
Thiamethoxam	1
Thiencarbazone methyl	2
Thifensulfuron	1.1
Tralkoxydim	0.25
Tralkoxydim acid	0.25
Triallate	15
Triasulfuron	0.28
Triclopyr	1.1
Trifloxystrobin	1

Appendix 2. Study site description and sediment profiles.

	Augusta	Bangor	Biddeford	Ellsworth	Farmington	Lewiston-Auburn	Portland	Presque Isle	Sanford	Waterville
Latitude (N)	44.300052	44.762990	43.487630	44.529249	44.652030	44.016586	43.650553	46.703424	43.407291	44.428553
Longitude (W)	-69.777300	-068.800168	-070.437260	-068.423335	-070.14324	-070.167325	-070.242530	-068.007480	-070.716215	-069.701766
Sediment										
Percent Organic Carbon	0.73	3.58	0.31	3.93	0.25	0.09	1	0.85	5.23	0.53
Percent Coarse	9.9	1.2	1	21.4	0.4	0.1	16.3	8.6	0.2	49.8
Percent Sand	76	30.8	91.9	28.7	95.3	96.1	77.4	77.9	33.5	42.5
Percent Silt	8.5	53.8	3.4	38.6	1.1	0	0	6.7	43.9	4.6
Percent Clay	5.6	14.2	3.7	11.3	3.1	3.7	6.3	6.9	22.4	3.1

Appendix 3. US EPA's Aquatic Life Benchmarks and Ecological Risk Assessments for Registered Pesticides.

Bold highlighted names indicated detection within the study. Names in blue text indicates surface water grab sampling while brown text indicates sediment sampling. Numbers in parentheses is the highest value found during the study; no number indicates POCIS sample. Benchmark values exceeded during the study are noted in red.

Analyte & EPA Aquatic Benchmarks ug/L (ppb)						
Analyte Name	Fish		Invertebrate		Non-Vascular	Vascular
	Acute	Chronic	Acute	Chronic	Acute	Acute
2,4-D (0.059)			12,500			299.2
Allethrin						
AMBA						
Acetochlor						
Acetochlor ESA	>90,000		>62,500		9,900	
Acetochlor OA						
Alachlor						
Alachlor ESA						
Alachlor OA						
Aminocyclopyrachlor						
Aminopyralid						
AMPA						
Atrazine (0.0081)	2,650	5	360	60	<1	4.6
Azoxystrobin	235	147	130	44	49	3,400
Bentazon (0.078)	95,000	9,830	31,150	101,200	4,500	5,350
Bifenthrin (1.3; mean=0.47)	0.075	0.04	0.8	0.0013		
Bromacil (0.013)	18,000	3,000	60,500	8,200	6.8	45
Bromoxynil						
Carbaryl						
Chlorpyrifos						
Chlorsulfuron						
Clodinafop acid						
Clopyralid						
Clothianidin	>50,750	9,700	11	0.05	64,000	>280,000
Cyfluthrin						
Cyhalothrin, Total						
Cypermethrin						
Deethyl atrazine (0.047)	See	Parent	Compound			
Deethyl isopropyl atrazine						
Deisopropyl atrazine						
Deltamethrin						
Dicamba						
Difenoconazole						

Dimethenamid	3,150	300	6,000	1,020	14	8.9
Dimethenamid OA						
Dimethoate						
Disulfoton sulfone						
Diuron (0.015)	200	26.4	80	200	2.4	15
FDAT (indaziflam metab)						
Fenpropathrin						
Fenvalerate						
Fipronil (0.0029)	41.5	2.2	0.11	0.011	140	>100
Fipronil desulfinyl						
Fipronil sulfide						
Fipronil sulfone	12.5	0.67	0.36	0.037	140	>100
Flucarbazone						
Flucarbazone sulfonamide						
Flumetsulam						
Flupyradifurone						
Fluroxypyr	7,150		>50,000		>10,000	
Glutaric acid						
Glyphosate						
Glufosinate						
Hydroxy atrazine (0.0066)	See	Parent	Compound			
Halosulfuron methyl						
Hexazinone (0.049)	137,000	17,000	75,800	20,000	7	37.4
Imazamethabenz acid metab (Q)						
Imazamethabenz ester						
Imazamox						
Imazapic (0.0037)	>50,000	96,000	>50,000	96,000	>44.1	6.22
Imazapyr (0.037)	>50,000	43,100	>50,000	97,100	12,200	24
Imazethapyr						
Imidacloprid (0.11)	114,500	9,000	0.385	0.01		
Indaziflam (Q)						
Isoxaben (0.011)	>500	400	>650	690	922	10
Isoxaflutole						
MCPA (0.019)					630	170
MCPP (0.02)	>46,500		>45,500	50,800	14	1,300
Malathion						
Malathion oxon						
Metalaxyl (Q)	65,000	9,100	14,000	1,200		85,000
Methomyl (0.016)	250	57	4.4	0.6		
Methoxyfenozide						
Metolachlor (Q)	1,900	30	550	1	8	21
Metolachlor ESA (ethane sulfonic acid) (0.17)	24,000		>54,000		>99,450	43,000
Metolachlor OA (oxanilic acid) (Q)	>46,500		7,700		57,100	>95,400

Metsulfuron methyl (Q)	>75,000	4,500	>75,000		31	0.36
cis-Permethrin						
trans-Permethrin						
Pinoxaden metabolite 854						
Pinoxaden metabolite 204						
Nicosulfuron						
Norflurazon						
Norflurazon desmethyl						
Oxamyl						
Parathion methyl oxon						
Phenothrin						
Phorate sulfone						
Phorate sulfoxide						
Picloram						
Picoxystrobin						
Piperonyl butoxide						
Prometon (0.017)	6,000	19,700	12,850	3,450	98	
Propiconazole (Q)	425	95	650	260	21	3,500
Prosulfuron					10.6	1.22
Pyrasulfotole (Q)	>48,000	580	>47,900	12,800	8,300	28
Pyroxsulam	>43,500	10,100	>49,500	10,400	111	2.57
Resmethrin						
Saflufenacil	>54,000	997	4,250	1,330	42	87
Simazine	3,200	60	500	40	6	67
Sulfentrazone	46,900	2,950	30,200	200	31	28.8
Sulfometuron methyl (0.0042)	>74,000		>75,000	97,000	4.3	0.45
Sulfosulfuron	>46,800	100,000	>47,300	102,000	310	1
Tebuconazole (0.028)	1,135	11	1,440	120	1,450	151
Tebuthiuron (0.0017)	53,000	9,300	148,500	21,800	50	130
Tetramethrin						
Tembotrione						
Terbacil (Q)	23,100	1,200	32,500	50	11	140
Terbufos sulfone						
Tetraconazole (Q)	1,925	300	1,315	190		310
Thiamethoxam	>57,000	20,000	17.5	0.74	>99,000	>90,200
Thiencarbazone methyl						
Thifensulfuron						
Tralkoxydim						
Tralkoxydim acid						
Triallate						
Triasulfuron						
Triclopyr (0.047)	58,500		66,450		32,500	
Trifloxystrobin						

Date: November 9, 2021

SURFACE WATER MONITORING REPORT

I. Study Overview:

- **Study Title:** Preliminary Report to the Board on the 2021 Water Quality Scoping Study of Aerially Applied Herbicides in Forestry

- **Project Lead:** Mary Tomlinson, Water Quality Specialist

II. Objective:

Conduct a baseline assessment of the occurrence of herbicides known to be applied via aerial application in forest management.

III. Study Area:

County: Aroostook, Franklin, Piscataquis, Somerset

Waterbody/Watershed: Daigle Brook, Fourmile Brook, Kibby Stream, Moose Brook, Moose River, Reed Brook, South Branch Machias River, Tomhegan Stream, two unnamed brooks (Table 1 and Figure 1)

Based on aerial application plans submitted to the BPC by timber companies, ten sites likely to receive drainage from site preparation or conifer release preparation were selected.

Table 1. Sites sampled in July 2021 for aerially applied herbicides used in managed Maine timberlands during 2020. Surface water grab samples and composite sediment samples were collected from each site.

Map Key	Town of Sample	Water Body	Coordinates	
			Latitude (N)	Longitude (W)
1	T17 R5 WELS	Daigle Brook	47.150140°	68.381590°
2	T17 R4 WELS	Unnamed Brook	47.11900	68.24754
3	Westmanland	Unnamed Brook	47.01361	68.26597
4	Kibby Twp	Kibby Stream	45.37000	70.55780
5	Skinner Twp	Moose River	45.44800	70.57280
6	Soldiertown	Tomhegan Stream	45.770554	69.884443
7	Big W	Moose Brook	45.816843	69.767564
8	T9 R7 WELS	Fourmile Brook	46.41883	68.58545
9	T8 R10 WELS	Reed Brook	46.35997	69.0104
10	T10 R7 WELS	S. Branch Machias River	46.526568	68.679185

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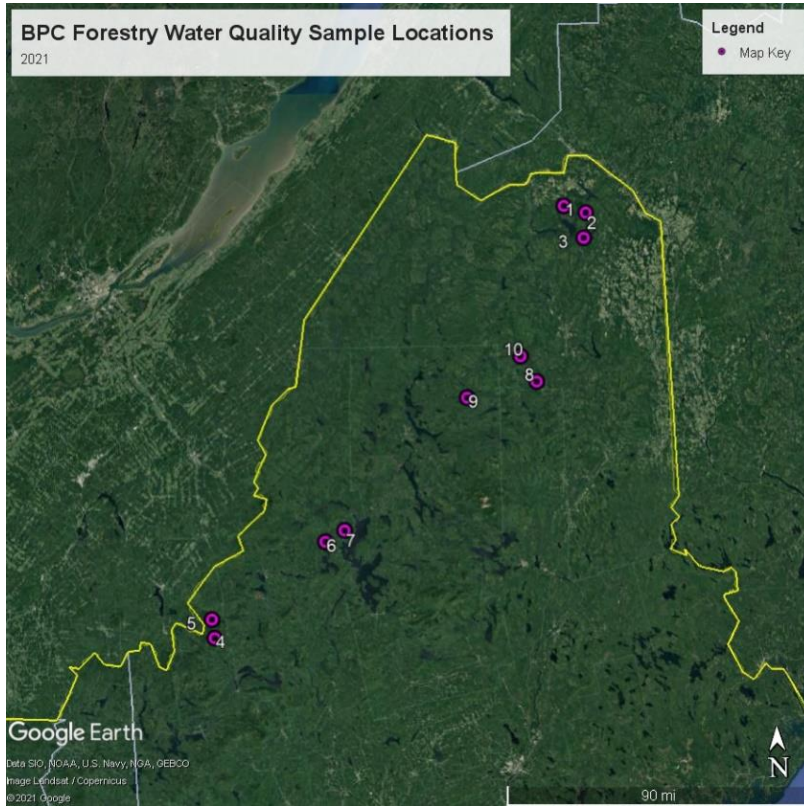


Figure 1. Location of sampling sites. Specific location information is displayed in Table 1.

IV. Land use type: Ag Urban Forest Mixed Other _____

V. Waterbody type:

Brook River Pond Lake Drainage Ditch/Culvert Storm drain outfall
 Other _____

VI. Sampling period: July 12, 2021 – July 13, 2021

VII. Target pesticides monitored: glyphosate, AMPA, imazapyr, metsulfuron methyl, sulfometuron methyl, and triclopyr (Table 2). A list of additional pesticides analyzed is located in Section XIII.

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Table 2. Aerially applied pesticides used by Irving Inc., Seven Islands Land Company, and Weyerhaeuser Timberlands in 2020 for site preparation and/or conifer release preparation.

Product Brand Name	EPA Reg. No.	Active Ingredient	Percent AI	Maximum Labeled Site Prep Rate/Acre	Maximum Labeled Release Rate/Acre
Accord XRT II	62719-556	glyphosate	50.20%	8 qts unless specified by species, 3-3.75 qts by species	Not labeled
Arsenal AC	241-299	imazapyr	53.1	12 oz	16 oz
Escort XP	432-1549	metsulfuron methyl	60	2 oz	Not labeled
Forestry Garlon XRT	62719-553	triclopyr	83.9	2.5-4.0 qts	1-2 qts
Oust XP	432-1552	sulfometuron methyl	75	3 oz (white spruce)	4 oz
Rodeo	62719-324	glyphosate	53.08	1.0-7.5 qts aerially	2.25 qts

VIII. Definitions:

- Analyte: Chemical compound that is the subject of chemical analysis
- Detection limit: The lowest concentration at which the presence of an analyte can confidently be identified by the laboratory
- Metabolite: An intermediate substance or end product formed when a chemical breaks down
- Nondetect (ND): Chemical is not detected; concentration is below the laboratory detection limit
- Q: Positive detection of the chemical, but concentration is below the reporting limit (RL)
- QA/QC: Quality assurance/quality control; performed to provide greater confidence in the data
- Quantifiable: Measurable
- Reporting limit (RL): Lowest concentration of a compound that can be measured and confirmed by the laboratory method
- US EPA Aquatic Life Benchmarks (ALB): Used as a screening tool to estimate risk of pesticides and their metabolites (degradates) to aquatic life in surface water. Concentrations below the ALB are not expected to represent a risk to aquatic life.

IX. Major findings:

Target pesticides not detected

Glyphosate, metsulfuron methyl, or triclopyr were not detected in any water or sediment samples collected. AMPA (a glyphosate metabolite) also was not detected. Analysis of samples from two of the ten study sites indicated no detections of any pesticides or their metabolite in water or sediment.

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Detections in water

Table 3 displays all pesticidal compounds detected in surface water grab samples by site; target pesticides of the study are shaded. Of the six compounds detected, imazapyr and sulfometuron methyl were the only two target compounds detected. There were 11 detections from six sites, three of which were above the RLs.

Four pesticidal compounds unrelated to aerial application in forest management were detected in water samples from six sites: 2,4-D, atrazine, deethyl atrazine (a metabolite of atrazine), and MCPP. There were 12 detections, two of which were above the RLs. Deethyl atrazine was the most frequently detected compound, present in water from six sites, but all detections were below the RL.

Table 3. Pesticide and metabolite detections in surface water samples collected July 2021 in managed northern Maine timberlands. The metabolite is indicated by an asterisk. Target analytes are shaded. Reporting limits are provided in Section XIII.

Town	Analyte [$\mu\text{g/L}$ (ppb)]					
	Imazapyr (RL=0.0035)	Sulfometuron methyl (RL=0.0025)	2,4-D (RL=0.0090)	Atrazine (RL=0.0022)	*Deethyl atrazine (RL=0.0017)	MCPP (RL=0.0044)
T17 R5 WELS	Q	Q	ND	ND	ND	ND
T17 R4 WELS	0.033	Q	ND	Q	Q	ND
Westmanland	Q	Q	ND	ND	ND	ND
Kibby Twp	ND	ND	ND	ND	Q	ND
Skinner Twp	Q	Q	0.014	ND	Q	Q
Soldiertown	Q	ND	0.0091	Q	Q	Q
Big W	ND	ND	ND	ND	ND	ND
T9 R7 WELS	ND	ND	ND	ND	ND	ND
T8 R10 WELS	0.016	0.0035	ND	ND	Q	ND
T10 R7 WELS	ND	ND	ND	ND	Q	ND

Table 4 compares the detections in water samples with the associated US EPA Aquatic and Ecological Risk Assessments for Registered Pesticides (2021). There were no pesticides detected above their associated Aquatic Life Benchmark.

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Table 4. Pesticide and metabolite detections in surface water, collected July 2021 from ten sites in northern Maine timberlands, compared with US EPA Aquatic and Ecological Risk Assessments for Registered Pesticides (2021). The lowest Aquatic Life Benchmark (ALB) for each pesticide detected is presented with its benchmark type. Target pesticide are shaded.

Pesticide	Number of Detections	Reporting Limit ug/L (ppb)	Lowest US EPA Benchmark (ALB) ¹ ug/L	ALB Type ¹	Number of ALB Exceedances
Imazapyr	6	0.0035	24	VA	0
Sulfometuron methyl	5	0.0025	0.45	VA	0
2,4-D	2	0.0090	299.2	VA	0
Atrazine	2	0.0022	<1	NA	0
Deethyl atrazine	6	0.0017	See atrazine		0
MCPP	2	0.0044	14	VA	0

¹Aquatic Life Benchmark Type: NA - non-vascular plants acute; VA - vascular plants acute

Detections in sediment

Sediments were analyzed for glyphosate, imazapyr, metsulfuron methyl, sulfometuron methyl, triclopyr, and AMPA (Table 4). There was a single detection each of imazapyr and sulfometuron.

Table 5. Analysis results for five pesticides and AMPA (glyphosate metabolite) in sediment, collected July 2021 in managed northern Maine timberlands. Results were reported as µg/L (ppb) on a dry weight basis. Reporting limit for glyphosate and AMPA in T17 R4 WELS was raised from 0.05 ppm to 0.25 ppm due to high moisture content.

Town	Analyte [µg/L (ppb)]					
	AMPA (RL=0.050)	Glyphosate (RL=0.050)	Imazapyr (RL=0.50)	Metsulfuron methyl (RL=0.50)	Sulfometuron methyl (R=0.050)	Triclopyr (RL=10.00)
T17 R5 WELS	*ND	ND	ND	ND	ND	ND
T17 R4 WELS	ND	ND	0.71	ND	ND	ND
Westmanland	ND	ND	ND	ND	0.14	ND
Kibby Twp	no sample	no sample	ND	ND	ND	ND
Skinner Twp	no sample	no sample	ND	ND	ND	ND
Soldiertown	no sample	no sample	ND	ND	ND	ND
Big W	no sample	no sample	ND	ND	ND	ND
T9 R7 WELS	ND	ND	ND	ND	ND	ND
T8 R10 WELS	ND	ND	ND	ND	ND	ND
T10 R7 WELS	ND	ND	ND	ND	ND	ND

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X. Conclusions:

1. Of the 104 pesticides analyzed for, six compounds (pesticides and metabolites) were detected either in water or sediment. Three were above the RLs and three below the RLs.
 2. There were 23 detections (active ingredients and metabolites combined) in water and two in sediment out of 1,032 and 46 possible detections for water and sediment respectively. Seven detections were above the RLs and 18 below the reporting limits.
 3. There were no exceedances of the US EPA Aquatic Life Benchmarks.
-

XI. QA/QC: The relative percent difference analysis indicates duplicates and split samples were within the acceptable range as established for this study. No pesticides were detected in blank samples.

XII. Data: water quality, analytical chemistry results

Water quality and monitoring results are available upon request. Please contact the Maine Board of Pesticides Control for the complete data set.

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XIII. Tables

List of 102 pesticides analyzed by Montana Department of Agriculture Analytical Laboratory.

Method: Montana Department of Agriculture, MTUNIV_W1, Revision 11: March 2021, "Universal Method for the Determination of Polar Pesticides in Water Using Solid Phase Extraction and Liquid Chromatography/Mass Spectrometry/Mass Spectrometry."

Analyte	Reporting Limit ug/L (ppb)
2,4-D	0.009
Acetochlor	0.14
Acetochlor ESA	0.02
Acetochlor OA	0.0084
Alachlor	0.11
Alachlor ESA	0.044
Alachlor OA	0.0068
AMBA	0.021
Aminocyclopyrachlor	0.025
Aminopyralid	0.03
Atrazine	0.0022
Azoxystrobin	0.0052
Bentazon	0.0022
Bromacil	0.0041
Bromoxynil	0.012
Carbaryl	0.014
Chlorpyrifos	0.06
Chlorsulfuron	0.0056
Clodinafop acid	0.013
Clopyralid	0.088
Clothianidin	0.016
Deethyl atrazine	0.0017
DEDIA	0.1
Deisopropyl atrazine	0.04
Dicamba	0.88
Difenoconazole	0.011
Dimethenamid	0.006
Dimethenamid OA	0.0072
Dimethoate	0.0022
Disulfoton sulfone	0.0066
Diuron	0.0053
FDAT (indaziflam met)	0.0051

Analyte	Reporting Limit ug/L (ppb)
Fipronil	0.0024
Fipronil desulfinyl	0.14
Fipronil sulfide	0.08
Fipronil sulfone	0.04
Flucarbazone	0.0024
Flucarbazone sulfonamide	0.0039
Flumetsulam	0.029
Flupyradifurone	0.045
Fluroxypyr	0.035
Glutaric acid	0.03
Hydroxy atrazine	0.004
Halosulfuron methyl	0.01
Hexazinone	0.0015
Imazamethabenz acid	0.0025
Imazamethabenz ester	0.001
Imazamox	0.0057
Imazapic	0.003
Imazapyr	0.0035
Imazethapyr	0.004
Imidacloprid	0.0018
Indaziflam	0.002
Isoxaben	0.003
Isoxaflutole	0.13
Malathion	0.028
Malathion oxon	0.0024
MCPA	0.0046
MCPP	0.0044
Metalaxyl	0.0035
Methomyl	0.012
Methoxyfenozide	0.01
Metolachlor	0.024
Metolachlor ESA	0.005

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List of 102 pesticides analyzed by Montana Department of Agriculture Analytical Laboratory. Method: Montana Department of Agriculture, MTUNIV_W1, Revision 11: March 2021, "Universal Method for the Determination of Polar Pesticides in Water Using Solid Phase Extraction and Liquid Chromatography/Mass Spectrometry/Mass Spectrometry."

Analyte	Reporting Limit ug/L (ppb)
Metolachlor OA	0.042
Metsulfuron methyl	0.01
Nicosulfuron	0.011
NOA 407854	0.0052
NOA 447204	0.02
Norflurazon	0.02
Norflurazon desmethyl	0.02
Oxamyl	0.01
Parathion methyl oxon	0.012
Phorate sulfone	0.024
Phorate sulfoxide	0.003
Picloram	0.28
Picoxystrobin	0.0075
Prometon	0.001
Propiconazole	0.01
Prosulfuron	0.005
Pyrasulfotole	0.02
Pyroxsulam	0.013
Saflufenacil	0.01

Analyte	Reporting Limit ug/L (ppb)
Simazine	0.0026
Sulfentrazone	0.035
Sulfometuron methyl	0.0025
Sulfosulfuron	0.0054
Tebuconazole	0.014
Tebuthiuron	0.0011
Tembotrione	0.073
Terbacil	0.0048
Terbufos sulfone	0.011
Tetraconazole	0.0039
Thiamethoxam	0.02
Thiencarbazone methyl	0.04
Thifensulfuron methyl	0.022
Tralkoxydim	0.0051
Tralkoxydim acid	0.005
Triallate	0.3
Triasulfuron	0.0055
Triclopyr	0.022
Trifloxystrobin	0.02

Proposed Administrative Consent Agreement Background Summary

Subject: Mosquito Squad of Southern Maine
10 Snow Canning Road
Scarborough, Maine 04074

Date of Incident(s): July 31, 2018 wrong property/ 2018 various dates unlicensed/unsupervised commercial applicators/ 2018, 2019, 2020, various dates incomplete commercial pesticide application records/ June 17, 2020 insufficient notification to registry member.

Background Narrative: The Board received a call that Mosquito Squad of Southern Maine (MSSM) made a pesticide application to the wrong property at 10 Wilson Road in Gorham. A follow up with the homeowner and MSSM confirmed the application was made on July 31, 2018 to the wrong property. The intended customer address was 5 Wilson Road. No applicator name was on the application record. The MSSM applicator said both houses and their garages were similar to the description on his work order. The MSSM had no method in place to positively identify their customer's property. There was no applicator name on the work order.

On September 10, 2018 the Board received a complaint that the MSSM was sending out unlicensed and unsupervised pesticide applicators to make custom pesticide application. An inspector conducted follow up inspections with MSSM and reviewed application records for 2018 and confirmed that three MSSM pesticide applicators made a minimum of 170 unlicensed and unsupervised custom applications in 2018. Application records were incomplete, including applicator name.

On July 17, 2019 a Board inspector conducted a routine inspection with a MSSM applicator making a pesticide application in Gray. The pesticide application record for that job was missing the application method, size of area treated, site treated, application rate, and a record of sprayer calibration.

On June 23, 2020 a follow up inspection was done on an odor complaint. A review determined MSSM records were incomplete, including application method, applicator's license number, size of area treated, target pest, site or crop treated, and sky conditions.

On June 23, 2020 a Board inspector conducted a follow up inspection with the company in response to a complaint from a 2020 registry member who resides at 9 Ash Lane in York about lack of sufficient notification for an application made on June 17, 2020. MSSM's phone log documented that the Company called the registry member's telephone number at 11:39 AM. The company made the application to a property listed as an abutter to the registry member on the 2020 Maine Pesticide Notification Registry from 11:49 AM to 11:54 AM. At least six hours of advance notice to registry members is required.

Summary of Violation(s):

CMR 01-026 Chapter 20 Section 7: Commercial applicators making outdoor treatments to residential properties must implement a system, based on Board approved methods, to positively identify the property of their customers. The Board shall adopt a policy listing approved methods of positive identification of the proper treatment site.

CMR 01-026 Chapter 20 Section 6(D)2: No person may apply a pesticide to a property of another unless prior authorization for the pesticide application has been obtained from the owner, manager, or legal occupant of that property.

22 M.R.S. § 1471-D (1) (A) and CMR 01-026 Chapter 31 Section 1(A) III: Any person making a pesticide application that is a custom application, as defined under 22 M.R.S. § 1471-C(5-A), must be a certified commercial applicator or under the direct supervision of a certified applicator in accordance with 22 M.R.S. § 1471-D (1) (A) and CMR 01-026 Chapter 31 Section 1(A) III.

CMR 01-026 Chapter 50, Section 1(A). **Pesticide Application Records**

- I. Commercial agricultural producers and commercial applicators shall maintain pesticide application records consistent with paragraph II. below for a period of two years from the date of application. Such records shall be kept current by recording all the required information on the same day the application is performed. These records shall be maintained at the primary place of business and available for inspection by representatives of the Board at reasonable times, upon request.
- II. Pesticide application records shall include, at a minimum:
 - a. Site information including town and location, crop or site treated, target organism, customer and customer address_(where applicable); and
 - i. for broadcast applications, size of treated area (when completed);
 - ii. for volumetric applications as described on the label, the volume treated;
 - iii. for non-broadcast applications (such as spot treatments, crack and crevice or stump treatments) a practical description of the scope or extent of the application (such as number of trees, stumps or rooms treated).
 - b. **Application information.** For each distinct site, records must include date and time of application(s), brand name of pesticide(s) applied, EPA registration number(s), active ingredient(s), restricted entry interval(s)

and/or ventilation period(s) (where applicable), method of application (type of equipment), dilution agent(s) (other than water), the licensed applicator's name and certification number, the name of any noncertified applicator that made the application (where applicable), and spray contracting firm (where applicable).

- c. **Rate information.** For each distinct site, application rate information must be maintained as follows:
 - i. **Restricted Use Pesticides.** For restricted use pesticides, applicators shall record the total amount of pesticide applied (undiluted).
 - ii. **General Use Pesticides.** For general use pesticides, applicators shall record:
 - (1) rate information as described in (i.) above; or
 - (2) the mix ratio and the total mix applied; or
 - (3) the mix ratio and the mix per unit area applied.
- d. For outdoor applications, except those listed below, weather conditions including wind speed and direction, air temperature and sky conditions recorded such as sunny, partly cloudy, overcast, foggy or rainy. No weather condition records need be kept for outdoor applications involving:
 - i. pesticides placed in bait stations;
 - ii. pesticide-impregnated devices placed on animals, such as ear tags; or
 - iii. pesticides injected into trees or utility poles

CMR 01-026 Chapter 28, Section 2 (D) to notify individuals listed on the Maine Pesticide Notification Registry at least six hours in advance of any pesticide application made to abutting properties within 250 feet of a registrant's listed property.

Rationale for Settlement: The large number of unlicensed/unsupervised commercial pesticide applications, deterrent for this company and others to send out unlicensed/unsupervised commercial applicators, foreseeability of the violations, the scope of violations (unlicensed applicators, lack of a system to positively ID treatment site/applying to wrong property, insufficient notification to a registry member, insufficient record keeping)

Attachments: Proposed Consent Agreement

OCT 25 2021

CK#1894

Date 10/20/21

Amt \$18,000

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY
BOARD OF PESTICIDES CONTROL

8

In the Matter of:)
Mosquito Squad of Southern Maine) ADMINISTRATIVE CONSENT AGREEMENT
10 Snow Canning Road) AND
Scarborough, Maine 04074) FINDINGS OF FACT

This Agreement by and between Mosquito Squad of Southern Maine (hereinafter called the "the Company") and the State of Maine Board of Pesticides Control (hereinafter called the "Board") is entered into pursuant to 22 M.R.S. §1471-M (2)(D) and in accordance with the Enforcement Protocol amended by the Board on December 13, 2013.

The parties to this Agreement agree as follows:

1. That the Company provides pest control services in Maine.
2. That on August 2, 2018, Mary Wassick, who resides at 10 Wilson Road in Gorham, called the Board to report that the Company had made an unauthorized pesticide application to her property on July 31, 2018.
3. That in response to the call, a Board inspector met with Wassick on August 3, 2018 to interview her and collect relevant information.
4. That, during the meeting, Wassick showed the inspector a Company work order dated July 31, 2018 that Wassick found under her door when she returned home on that date. The work order indicated that a mosquito and tick application had been made to Adam Johnson's property, located at 5 Wilson Road in Gorham. The work order had a place to record the name of the Company employee that provided the service, but the applicator information was left blank.
5. That during the meeting described in paragraphs three and four, the inspector documented the Company's work order and also collected vegetation samples from an area next to Wassick's vegetable garden.
6. That based on the information and evidence collected from the meeting with Wassick, the inspector called the Company and got the name of the pesticides applied to Wassick's property. The inspector then called both the Board toxicologist and Wassick to convey the information about the pesticides applied.
7. That on August 7, 2018 a Board inspector met with Company applicator William Sullivan and Company administrator Scott Conrad to conduct a follow up inspection for the pesticides applied to Wassick's property on July 31, 2018.
8. That during the August 7, 2018 meeting, the inspector documented that Sullivan applied Bifen I/T insecticide/termiticide, Fendona CS insecticide, and Martin's 10% Permethrin Multi-Purpose insecticide to Wassick's lawn and property perimeter on July 31, 2018.
9. That, during the August 7, 2018 meeting, Williams told the inspector that the description of both Wassick's and Johnson's houses/garages was similar on his paperwork. In Williams' written statement, Williams further attributed the misplaced application to the location of the mailboxes, to the fact that it was the last application of the day, and to his over-confidence in knowing which property to treat.

10. That, during the August 7, 2018 meeting, the inspector collected specimen labels for Bifen I/T insecticide/termiticide, Fendona CS insecticide, and Martin's 10% Permethrin Multi-Purpose insecticide. The inspector also collected Sullivan's handwritten statement about the misplaced pesticide application and the original work order for the intended Johnson property application.
11. That CMR 01-026 Chapter 20 Section 7 requires that Commercial applicators making outdoor treatments to residential properties to implement a system, based on Board approved methods, to positively identify the property of their customers.
12. That the Company's original work order, as described in paragraph ten, was reviewed to see if the Company used a Board approved method to positively identify Adam Johnson's property at 5 Wilson Road in Gorham on July 31, 2018 before making the pesticide application. The review showed that the Company had not.
13. That the circumstances described in paragraphs one through twelve constitute a violation of CMR 01-026 Chapter 20 Section 7.
14. That CMR 01-026 Chapter 20 Section 6(D)(2) provides that no person may apply a pesticide to a property of another unless prior authorization for the pesticide application has been obtained from the owner, manager or legal occupant of that property.
15. That the Company did not have Wassick's authorization to make a pesticide application to her property on July 31, 2018.
16. That the circumstances described in paragraphs two through ten, fourteen and fifteen constitute a violation of CMR 01-026 Chapter 20 Section 6(D)(2).
17. That on September 10, 2018, the Board staff received a complaint that the Company had sent out unlicensed and unsupervised employees to make commercial pesticide applications.
18. That in response to the complaint described in paragraph seventeen, a Board inspector conducted follow up inspections with the Company on September 13 and September 28, 2018. The inspector collected Company pesticide application records on September 28 for 2018.
19. That from a review of the Company's 2018 pesticide application records, it was determined that no fewer than 170 custom pesticide applications had been made by at least three unlicensed and unsupervised Company employees.
20. That any person making a custom pesticide application, as that term is defined under 22 M.R.S. § 1471-C(5-A), must either be a certified commercial applicator or be under the direct supervision of a certified applicator in accordance with 22 M.R.S. § 1471-D (1) (A) and CMR 01-026 Chapter 31 Section 1(A) III.
21. That a custom application, as defined in 22 M.R.S. § 1471-C(5-A), includes any application of any pesticide under contract or for which compensation is received, or any application of a pesticide to a property open to use by the public.
22. That the circumstances described in paragraphs seventeen through twenty-one constitute 170 violations of 22 M.R.S. § 1471-D (1) (A) and CMR 01-026 Chapter 31 Section 1(A) III.

23. That commercial applicators must keep pesticide application records as required by CMR 01-026 Chapter 50, Section 1(A).
24. That a review of the Company's pesticide application records collected during the September 28, 2018 inspection showed that the Company's records were incomplete and did not include the name of the applicators who made the applications.
25. That the circumstances described in paragraphs eighteen, twenty-three and twenty-four, constitute violations of CMR 01-026 Chapter 50, Section 1(A).
26. That on July 17, 2019 a Board inspector conducted an inspection with Company applicators making a commercial pesticide application in Gray. The pesticide application record for that job was missing the application method, size of area treated, site treated, application rate, and a record of sprayer calibration.
27. That the circumstances described in paragraphs twenty-three and twenty-six, constitute a violation of CMR 01-026 Chapter 50, Section 1(A).
28. That on June 23, 2020 a Board inspector conducted a follow up inspection with the Company in response to a complaint about odors from an application made on May 14, 2020.
29. That a review of the Company's pesticide application records collected during the June 23, 2020 inspection showed that the Company's records were incomplete, including application method, applicator's license number, size of area treated, target pest, site or crop treated, and sky conditions.
30. That the circumstances described in paragraphs twenty-three, twenty- eight, and twenty-nine constitute a violation of CMR 01-026 Chapter 50, Section 1(A).
31. That on June 23, 2020 a Board inspector also conducted a follow up inspection with the Company in response to a complaint from a 2020 pesticide notification registry member who resides at 9 Ash Lane in York about lack of notification for an application made on June 17, 2020.
32. That from the June 23, 2020 inspection, it was determined that a Company applicator made an outdoor pesticide application to a customer's property at 3 Ash Lane on June 17, 2020. The application record for this job indicated the application was made from 11:49 AM to 11:54 AM. A phone log kept by the Company recorded that a phone call was made to the registry member's phone number at 11:39 AM on June 17, 2020.
33. That the Company's customer at 3 Ash Lane is listed as an abutter to the registry member at 9 Ash Lane on the 2020 Maine Pesticide Notification Registry.
34. That commercial applicators are required by CMR 01-026 Chapter 28, Section 2 (D) to notify individuals listed on the Maine Pesticide Notification Registry at least six hours in advance of any pesticide application made to abutting properties within 250 feet of a registrant's listed property.
35. That the Company provided the registry member with only 10 minutes of advance notification before the pesticide application was made to that registry member's abutting property.
36. That the circumstances in paragraphs thirty-one through thirty-five constitute a violation of CMR 01-026 Chapter 28, Section 2 (D).

37. That the application record that was reviewed during the June 23, 2020 inspection was missing the following information: application method, active ingredient, REI, applicator license number, size of treated area, target pest, site or crop and sky conditions.
38. That the circumstances described in paragraphs thirty-one, thirty-two, and thirty-seven, constitute a violation of CMR 01-026 Chapter 50, Section (A).
39. That the Board has regulatory authority over the activities described herein.
40. That the Company expressly waives:
 - a. Notice of or opportunity for hearing;
 - b. Any and all further procedural steps before the Board; and
 - c. The making of any further findings of fact before the Board
41. That this Agreement shall not become effective unless and until the Board accepts it.
42. That in consideration for the release by the Board of the cause of action which the Board has against the Company resulting from the violations described in paragraphs thirteen, sixteen, twenty-two, twenty-five, twenty-seven, thirty, thirty-six, and thirty-eight, the Company agrees to pay a penalty to the State of Maine in the sum of \$20,000. The Board will suspend \$2,000 of the \$20,000 penalty on the condition that the Company commits no further violations for a two-year period. The unsuspended portion (\$18,000) shall be due immediately. The start date for the two-year period would be the date the Board ratifies the consent agreement. (Please make checks payable to Treasurer, State of Maine).

IN WITNESS WHEREOF, the parties have executed this Agreement of four pages.

MOSQUITO SQUAD OF SOUTHERN MAINE

By:  Date: 10-21-21

Type or Print Name: Erik Hansen

BOARD OF PESTICIDES CONTROL

By: _____ Date: _____
Megan Patterson, Director

APPROVED:

By: _____ Date: _____
Mark Randlett, Assistant Attorney General

Annual Obsolete Pesticide Collection Program Fall 2021 Update

Number of sites: 4

Locations: Presque Isle, Bangor, Augusta, and Portland

Amounts (lbs.) and number of participants:

2017 – 8,096, 64 participants

2018 – 4,680, 65 participants

2019 – 7,510, 79 participants

2020 – 5,245, 128 participants

2021 – 12,000, 63 participants (4 sites)

Average over last 5 years: 7,506.2 lbs. with 64 participants

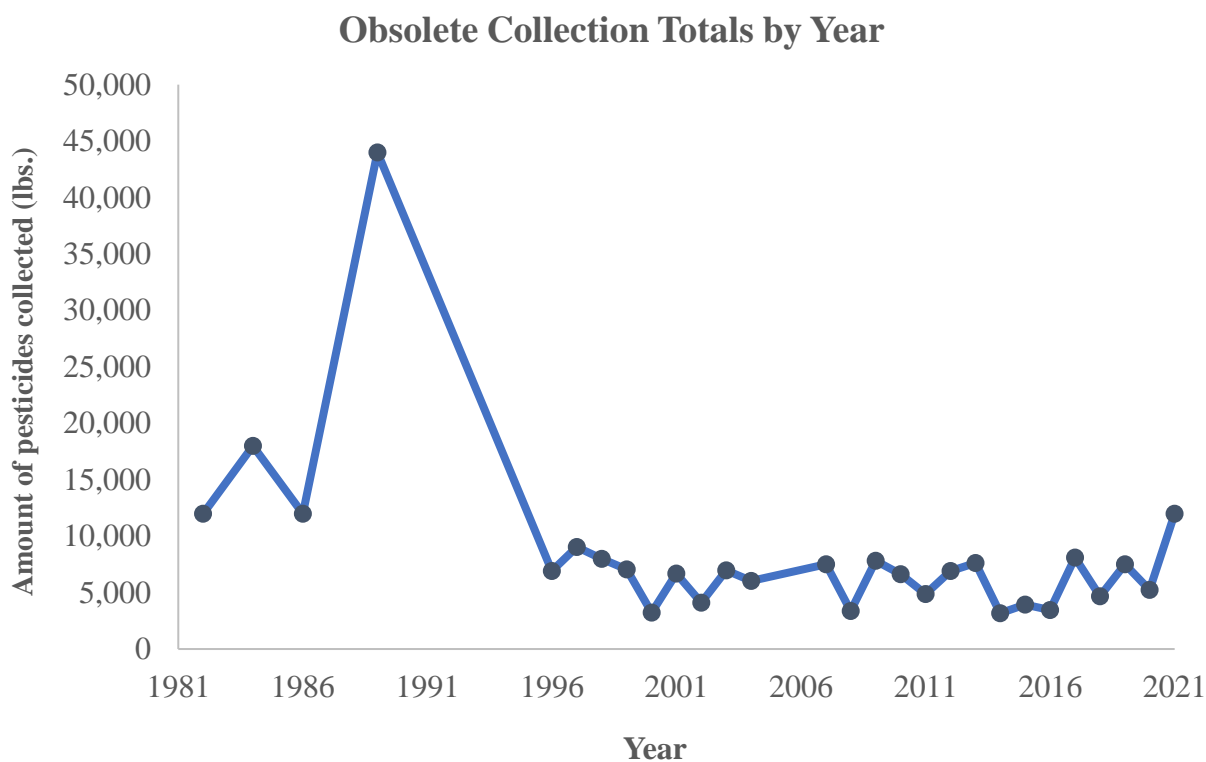


Figure 1. Amount of obsolete pesticides received over time through the Obsolete Pesticide Collection Program in Maine. Note: Totals for 2021 do not include the Bangor site, totals will be updated as manifests are received. Total waste removed from the state of Maine since 1982 is 236,796 lbs.