Interim Report of the Board of Pesticides Control Medical Advisory Committee to the 130th Maine State Legislature on LD 519 and Herbicides Applied on School Grounds

LEGISLATIVE REPORT
FISCAL YEAR 2021

MAINE DEPARTMENT OF AGRICULTURE CONSERVATION & FORESTRY

Amanda E. Beal
Commissioner

Randy Charette
Deputy Commissioner

18 Elkins Lane
Augusta, ME 04333

(207) 287-3200
www.maine.gov/dacf

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Introduction

In 2021, the Maine Legislature passed LD 519, An Act To Protect Children from Exposure to Toxic Chemicals. This bill was subsequently signed by the Governor on June 14 and went into effect on October 18, 2021. One of the two major provisions of the bill created a state law prohibiting use of glyphosate and dicamba within 75 feet of school grounds.

The second provision directed the Board of Pesticides Control (BPC) to convene its Medical Advisory Committee (MAC) to evaluate the potential impact of herbicides used on school grounds on human health. The BPC was further directed to submit a report on the findings and recommendations, including suggested legislation, of the MAC no later than February 1, 2022, to the Joint Standing Committee on Agriculture, Conservation and Forestry.

This report summarizes the MAC's activities and findings. Specifically, this report discusses the current MAC's processes; current BPC regulations that schools must follow; MAC committee member discussions and comments; additional staff reports and recommendations; and the proposed next steps to improve BPC's best management practices and BPC regulations, and program responses regarding herbicide use on school grounds.

Purpose and Function of the MAC

The Maine BPC recognizes the potential impact of some pesticides on human health, as well as the importance of protecting the beneficial uses of most pesticides when used carefully by responsible applicators. In order to separate potentially harmful chemicals from the essentially safe ones, the public member Board of Pesticides Control (Board) needs expert advisors, knowledgeable in the field of human health research or clinical practice, who can add their assessments to the economic and benefit recommendations of others prior to the Board initiating a ruling on pesticide restrictions. These advisors join the MAC as volunteer members.

Constraints on Resources

The MAC is composed of three standing and up to six ad hoc members. Historically, the standing membership consisted of the medical professional serving on the Board, the State Toxicologist or their appointee, and the Medical Director for the Northern New England Poison Control (NNEPC). In July 2021, the Board attempted to convene the MAC in response to LD 519, however the State Toxicologist indicated that due to the demands of COVID and response to PFAS, the toxicology staff of Department of Health and Human Services (DHHS) would be unable to take on additional responsibilities or to provide an appointee. At the same July meeting, the Board revised the MAC policy to provide flexibility in appointment of a toxicologist and subsequently approved the service of Dr. Lebelle Hicks. Following confirmation of availability from Dr. Mark Neavyn (NNEPC) and ad hoc member, Emily Poland, RN, Maine Department of Education, the MAC was officially convened at the August 24, 2021, public meeting of the Board.

Process

Meetings

To date, the MAC chairman has convened two meetings of the members. The first meeting was on September 20, 2021, and the second was on November 18, 2021. Detailed minutes for all MAC meetings are included in Addendum G.

Data Request and Results

At the first meeting of the MAC, BPC staff offered, and the MAC asked staff to collect and summarize 2020 and 2021 commercial applicator use records for applications of herbicides made on school grounds. Based on MAC member commentary, BPC staff also initiated a request with Northern New England Poison Control for data on pesticide exposures at Maine schools. The results of both meetings are provided in this report.

School Herbicide Application Records Request Results

Data constraints

In order to evaluate the potential impact of herbicides used on school grounds on human health, the BPC made a commercial applicator records request for applications (also known as a data request) made on school grounds. The data collected presented some challenges to staff analyzing the information. Many applications had missing dates or dates that were likely incorrect, locations that were difficult to connect to the type/age range of the school using them, lacked or had off timing of applications, lacked a target pest, lacked the rate or undiluted active ingredient amount, or didn't include an application method. Due to these irregularities, data do not tally across topics. The following graphs and tables are presented to illustrate trends but do not currently represent the complete data set. Records also revealed that some schools were scheduling applications on an annual basis, a method which does not support Integrated Pest Management (IPM) techniques. Overall, the data quality that the BPC received made analyses difficult, but opened conversations about data integrity, validation, and future projects relating to pesticide use data in schools.

When are applications occurring?

The pesticide application data indicates that most applications were made in May and June, Figure 1. Under an IPM framework, the timing of pesticide applications focuses on when control of the pest is most effective. Effective timing is judged by surveying the severity of the pest problem and applications should not occur a calendar schedule. Without an additional review of the IPM logs generated by the School IPM Coordinator we cannot speak to this aspect of application timing. From a student exposure standpoint this pattern indicates that children are present on school grounds during the days and weeks following herbicide applications.

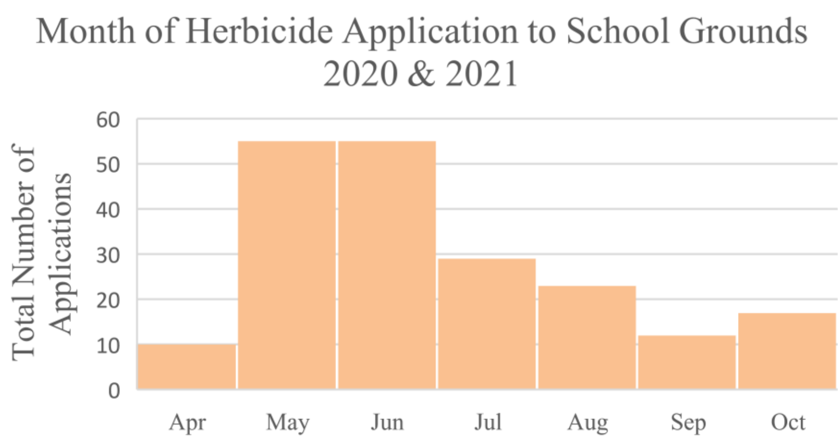


Figure 1. Number of applications occurring each month of the year. Applications for 2021 are not complete for the year because the data request occurred mid-season and only include applications made up until September 2021.

How many applications are occurring?

The data request produced 450 individual herbicide application event records. Of those records, 87 different schools were identified across 337 applications. As highlighted in the *Data Constraints* section above, many of the records received were unusable for various reasons but mostly missing pieces of data. Additionally, we do not know if every applicator making these applications responded to our voluntary request for information.

Due to the different ways applicators completed the data forms it was not possible to determine the specific location on school grounds where the applications were taking place. In pesticide regulation this location is called the "site". Site refers to the target site of the application and the pesticide label must list a target site in order for an appliation to be legal. However, from a regulatory perspective there is no difference between turf grass in the front lawn and the turf grass of a playing field. Some application records included greater detail and could be dissected to provide the information displayed in Table 1. The applications where it wasn't possible to tell the exact location on school grounds were given a generic category of "field" for the purposes of investigating patterns of use. Specifically, data were sought to answer the question, *are cosmetic applications or maintaince for high-use athletic surfaces driving pesticide appliations on school grounds?* Given that most of the records fell into the ambiguous "field" category, and the lower numbers of specific records received, this is difficult to answer.. While there are numerically more althetic applications, the acreage of the lawn (and presumably cosmetic) applications is much greater.

Table 1. Breakdown of herbicide applications by location on school grounds. Number of applications, total acreage treated, and average size of each application recorded in 2020 and 2021.

Use Type	Number of Applications	Total Acreage	Average Acreage
Generic "Field" Entry	379	1296	3.4
Athletic Field Specified	35	25	0.7
Lawn Specified	20	81	4.1
Baseball/Softball Infield	7	4	0.5
Parking Lot, Curb, Etc	4	3	0.8
Fenceline	3	1	0.2
Building	2	15	7.5

The average area of herbicide applications made was 158,700 sq ft or 3.6 acres in 2020 and 139,000 sq ft or 3.2 acres in 2021. Overall, less product was applied during applications in 2020 (Figure 2). Pesticide use records show that in both 2020 and 2021 schools that used pesticides had on average 2.7 applications made each year.

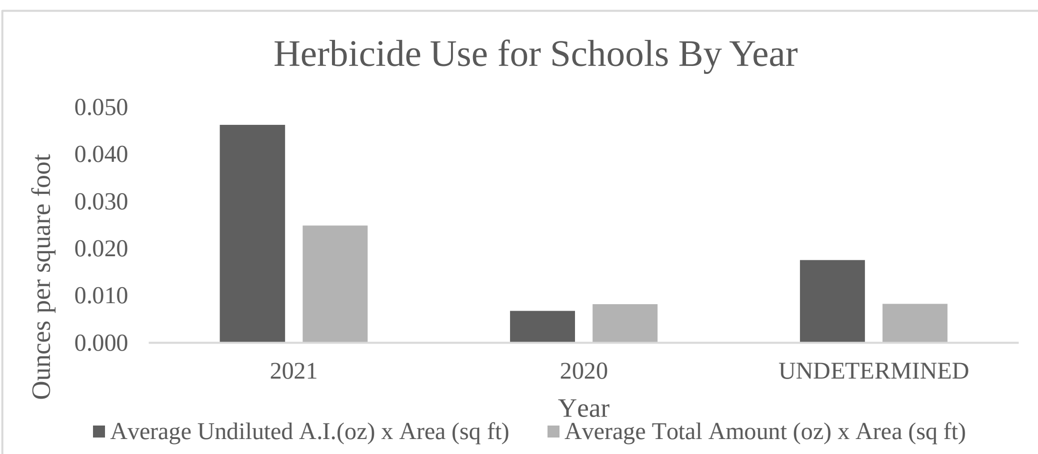


Figure 2. Ounces of active ingredient per square foot of herbicide use on school grounds in 2021, 2020, and undetermined year. Applications for 2021 are not complete based on when data request occurred and only include applications made until September 2021.

What herbicides are being applied?

Reported applications were made with 22 different product types. These 22 products were either single active ingredient products or combination products with up to four active ingredients. These 22 products are comprised of 23 active ingredients, listed in Table 2. Mixtures of 2,4-D and triclopyr were the most commonly applied both in terms of total area and number of applications. Pendimethalin, glyphosate, mecoprop-p, and dicamba also occurred very frequently.

Several of the active ingredients found during this data request have prompted a follow-up request to BPC enforcement staff. Six of the 23 active ingredients may have been used on school property improperly. Pesticide labels state allowable uses for the product and are federal law. No instructions on any registered pesticide label can be disregarded. Table 2 includes the identities of the six active ingredients associated with products sent to enforcement for follow up. Active ingredients in products that are not labelled for use on school grounds may belong to other products that are approved for use on school grounds. Each registered product represents a unique risk, even something like the percentage of the active ingredient can dictate where a pesticide may or may not be used.

Table 2. Active ingredients in Maine reportedly used on school grounds, associated products and if they are labeled for use on school grounds, product brand names not labeled for use on school grounds, and EPA registration numbers.

Active ingredients	Associated with products not labeled for use on school grounds	Product Brand Names not labeled for use on school grounds	Product EPA Registration Numbers
2,4-D			
2,4-D propionic acid			
Amicarbazone	X	Amicarbazone WDG herbicide	66330-46
Ammonium nonanoate			
Carfentrazone-ethyl			
Clopyralid			
Clove oil	X	Unknown brand name	N/A 25(b)
Dicamba			
Dithiopyr			
Eugenol	X	Unknown brand name	N/A 25(b)

Table 2. Active ingredients in Maine reportedly used on school grounds, associated products and if they are labeled for use on school grounds, product brand names not labeled for use on school grounds, and EPA registration numbers

Active ingredients	Associated with products not labeled for use on school grounds	Product Brand Names not labeled for use on school grounds	Product EPA Registration Numbers
Fenoxaprop-p-ethyl	X	Acclaim	432-950
Fluoroxypyr-meptyl			
Glufosinate			
Glyphosate			
Imazapyr	X	Unknown brand name	81927-53882
MCPA			
Mecoprop-p			
Mesotrione	X	-Tenacity -21-22-4 Fertilizer With 0.08% Mesotrione -Lebanon Proscape Starter Fertilizer With 0.08% Meso Preemergent Weed Control 21-22-4	100-1267 538-317-9198 538-317-961
Pendimethalin			
Prodiamine			
Quinclorac			
Sulfentrazone			
Triclopyr			

What types of schools are having herbicide applications?

There are 711 schools in Maine. Applications appear to be evenly split between elementary and high schools. Many schools have combined age ranges, and because of how schools are classified, middle schools appear to be underrepresented. Table 3 presents the breakdown of school age range and number of applications.

Table 3. Number of applications made in Maine in 2020 and 2021 across different school age ranges.

Reporting Year	School Age Range	Number of Applications
2020		
	Elementary	23
	Elementary - Middle	24
	Middle	12
	Middle - High	1
	High	31
	Elementary – High	1
	School type not specified	6
2021		
	Elementary	18
	Elementary - Middle	17
	Middle	8
	Middle - High	4
	High	40
	Elementary - High	2
	School type not specified	8
Year not specified		
	Elementary	1
	Elementary - Middle	20
	Middle	17
	Middle - High	23
	High	98
	Elementary - High	2
	School type not specified	100

Note: Applications for 2021 do not represent 12 calendar months; data were requested to be submitted in September 2021.

Northern New England Poison Center Reported School Exposures to Herbicides

Northern New England Poison Center (NNEPC) was queried for information on pesticide exposures at schools. NNEPC data are generated by examination of requests (mostly calls) for information from the public and health providers, these data do not represent verified exposures. These data provide a window into the likelihood of exposure to herbicide products for Maine schools. These data do not represent a complete picture of school exposures because NNEPC calls are likely to reflect only acute exposures, or those exposures that cause immediate reactions. However, the general trends suggest areas of focus and special concerns.

"Pesticides" are a broad category of chemicals that touches many aspects of our lives. NNEPC was specifically asked to look at all pesticide exposures, not just herbicide exposures, so that patterns of student exposures might be discovered. It is known that most harmful interactions children have with pesticides are due to young children eating or drinking pesticide products they find in the home. Proper storage of herbicide products is important in preventing herbicide exposures. The data from NNEPC suggest in Maine there are approximately ten in-school pesticide exposure incidents each year. The past five years of data were queried which produced 53 calls to poison control. Two of the 53 calls are related to herbicide exposures and neither incident involved actual exposure to an herbicide.

The data are taken from people of all ages at the school, see Figure 4 for age breakdowns. Forty percent of all calls concerned elementary and middle school aged students, while 26% of all calls concerned middle and high school students. For the calls related to herbicide exposures; one call was split between middle-school and high-school aged students.

School Pesticide Exposure Incidents By Age Group

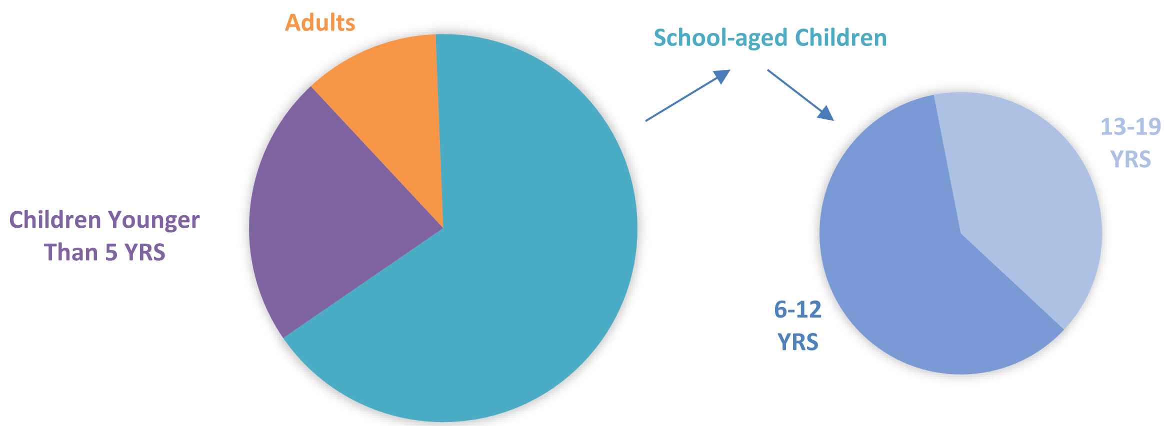


Figure 4. Age distribution of calls to Northern New England Poison Center for pesticide exposures at schools in Maine from 2016 to 2021.

As anticipated, cleaning products and disinfectant exposures contributed to the largest portion of exposure incidents. The public's general disregard for the hazard of familiar chemicals and the volume and ubiquity of their use predisposes the likelihood of these exposures. Just over 60% of the calls were related to cleaning products. As these data were collected across a 5-yr time span that includes the COVID pandemic some of these disinfection incidents will be tied to increased cleaning and disinfection activities. NNEPC did experience a large increase in call volume due to the pandemic, however, much of the increase would not be captured here because cleaners are not necessarily disinfectants/pesticides. The second largest category of calls is related to insect repellents. Skin reactions to repellent products and getting repellent chemicals in the eyes following application happen frequently in this population demographic. Figure 5 presents a breakdown of the calls to NNEPC by the type of pesticide.

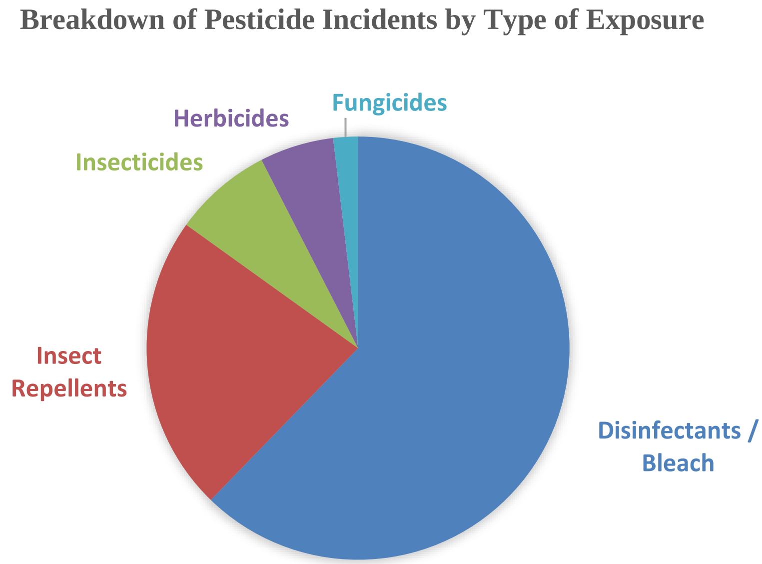


Figure 5. In-school exposures to pesticides organized by type of pesticide. Calls received by Northern New England Poison Center from 2016 to 2021. Data based on 53 calls received over five years.

The data demonstrate pesticide incidents at schools have had generally minor, if any, effects on exposed individuals. Exposures with effects are followed up by NNEPC staff to determine exposure outcomes. Ninety-four percent of calls for pesticide exposures at schools were not followed up because either there was no actual exposure, the effect was unrelated to the exposure, or the effect was minimal and not likely to rise to the level of a minor effect. There were three minor effects, that level of effect is described as self-limiting. There were no exposures more severe than minor, but for context, the next most severe category, moderate effect, is described as more persistent or severe but not life threatening. Table 10 summarizes the breakdown in clinical outcomes following in-school pesticide exposures. Both of the calls related to herbicide exposures were categorized as “Confirmed Non-Exposure” or “Unrelated Effect”.

Table 10. Severity of the outcomes following exposure to pesticides while in Maine schools. All ages and types of exposures from 2016 to 2021 are included.

Patient Medical Outcome	Percentage
Confirmed Non-exposure or unrelated effect	9
No effect	4
Not followed, minimal clinical effects possible (no more than minor effect possible)	81
Minor effect	6

The school exposure data highlight the need for carefully considering pesticide choices on school grounds. When childhood dares include challenges like, "how many dandelion heads can you eat?" it is obvious that pesticide choice and management procedures are important.

MAC Suggested Action Items and Consensus-Based Recommendations

During meetings of the MAC, membership engaged in robust and far-ranging conversation. A detailed summary of the MAC member meetings can be found in Appendix G—the meeting minutes. The MAC members represented a diversity of opinions and were unable to achieve universal consensus. However, they were able to agree upon several action items and recommendations for Board consideration. The MAC has suggested the following action items and made the following recommendations:

Action Items

- Members agreed to request that staff collect recent (2020 and 2021 through September) data for herbicide use on school grounds. This action item was completed in 2021.
- Members agreed to review the collected data, IPM best management practices for school grounds and Chapter 27 of Maine pesticide law pertaining to IPM and pesticide use on school grounds. This action item was completed in 2021.

MAC Recommendations

- Review existing rules and ensure use of IPM by schools is understood to be mandatory.
- Explore additional chemical specific details in a risk assessment.
- Request that the Board reevaluate IPM coordinator training for content and legality of using certain products on school grounds.

- Recommend that staff conduct a survey of other states and their respective regulations of pesticide use on school grounds.

Ensure IPM is Understood to be a Requirement for Schools

Currently, the regulations that schools must follow (see Addendum A) incorporate IPM as a requirement. Based on the timings and dates schools provided with data that BPC staff requested, it appears that many schools may be scheduling their herbicide applications on an annual basis. This raises questions about how actionable pest levels (thresholds) are being determined and, subsequently, when chemical control (pesticides) should be applied, which may not constitute use of IPM techniques. It may be prudent review current rules and ensure schools have an IPM program in place that allows them to identify pests, utilize pest biology for management, monitor pests, sets pest level thresholds for when pesticide intervention is necessary, and monitor results of IPM for improvement. Subsequent outreach to schools would not only apply to herbicide use on school grounds, but all aspects of school pest management for rodents, insects, plants, microbials, etc.

Consider Exploring Additional Chemical Specific Details in a Risk Assessment

The risk from pesticides is always assessed by measuring hazard and exposure; when combined, the relevant potential for harm can be predicted and then presented as a risk assessment. The basis for risk assessments follows the elements of the risk equation, below. Risk assessments balance out extreme harm that is unlikely to ever happen and mild harm that is so continuous it causes problems in order to produce an estimate of how harmful a chemical is and how much exposure to the chemical is expected to occur.

Risk Equation

Exposure		Hazard		Risk
-how much gets into the	X	-how inherently toxic a chemical	=	-the realistic potential for

Pesticide risk assessment is predicated on an assumption that all pesticide chemicals start off as hazardous and most risk (or potential for harm) is managed by controlling exposure. Exposure modeling is performed for each pesticide product during the new pesticide registration process by EPA, and again cyclically every 15 years during re-registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). The Federal Food Quality Protection Act (FQPA) adds to FIFRA and requires EPA to consider children and aggregate exposures all aspects of our lives during pesticide risk assessments.

Understanding school herbicide exposures

Generalizing about pesticides is difficult due to the varied nature of each product. For illustrative purposes, 2,4-D school-time exposures have been assessed and are presented in Addendum F. 2,4-D was selected as an example because it was one of the most commonly-used herbicides reported to the BPC during the 2020 & 2021 data request. To identify the role of school-time exposures EPA’s Exposure Factor Handbook (2011 Edition) was consulted to determine:

- how much time children spend in school,
- how much school time is spent indoors vs outdoors,
- how much soil an average child ingests,
- how much breathing children do at school through various activities and what portion of time is spent in each activity.

School-specific factors can be combined with other inputs students receive across their lifetime. Staff suggest that looking at each herbicide used on school grounds to assess, both the exposure potential unique to children and updated hazard studies from the literature. A detailed exposure assessment that focuses on children’s school exposures to 2,4-D, is available in Addendum F as an example of the type of work that can be performed for the rest of the herbicides.

Reevaluation of IPM Coordinator Training

In order to ensure that the IPM Coordinator Training includes content on pesticide product selection and identification products lawful for use on school grounds the MAC recommended an evaluation of the IPM coordinator training.

Survey of Other States

In order to conduct amendments to current rules, BPC staff suggest a survey to other states regarding their regulations pertaining to herbicide use on school grounds. BPC frequently surveys other state pesticides programs and often receives robust survey responses and relevant information.

Additional Considerations Proposed by Staff

In addition to the MAC recommendations and based on the review of other documents (see Addendums A, B, C, & D), staff have proposed the following additional considerations:

- Refer possible unlawful use of herbicides on school grounds to BPC enforcement staff.
- Consider the effects of turf quality on the frequency of student athlete injuries.
- Conduct a review of IPM Best Management Practices (BMPs).

- Use the results of the MAC recommended risk assessment to identify lower risk pesticides.

Referral of Possible Unlawful Use to Enforcement

Based on the records received during the data request several of the products reportedly used on school grounds have prompted a follow-up request to BPC enforcement staff. Six products of the many identified via the records request may have been used on school property in a manner inconsistent with their labeling, Table 2.

Consider the Effects of Turf Quality on Frequency of Student Athlete Injuries

A common justification for the use of herbicides on school grounds is the role of broadleaf weeds in increasing slip and fall injuries of student athletes. High performance turf requires intense maintenance to avoid hazardous conditions for persons utilizing the field (see Addendum D). Proper use of pesticides is predicated on the risk of use being outweighed by the benefit of use. Researchers looking at prohibitions of herbicide use on school grounds generally find poorer quality turf when conventional herbicides are not allowed. Alternative methods for grounds management frequently require expensive equipment and additional person-hours placing some alternative approaches out of reach for school districts with limited funding.

Review of IPM Best Management Practices (BMPs)

School IPM BMPs are well established in Maine, with many documents already existing to educate the public, school officials, and IPM coordinators about what IPM is and how to best implement IPM programs into their existing framework (see Addendum B). The 125th Legislature, LD 837, Resolve, To Enhance the Use of Integrated Pest Management on School Grounds, initiated research into the development of IPM BMPs for school grounds (see Addendum B). These BMPs were established through a collaborative effort with *ad hoc* committee members from town municipalities, Maine CDC, UMaine Cooperative extension, members of the pest management industry, Maine DACF, Thomas College, MOFGA, U-Mass, Penn State University, Cornell cooperative extension, Casco Bay Estuary Partnership, and Board members. A full report detailing the process and findings from this committee can be accessed via the BPC website (https://www.maine.gov/dacf/php/pesticides/documents2/legislative%20reports/School%20IPM%20Report%20Feb%202014-FINAL.pdf). Staff suggest reviewing these existing BMPs with a similarly representative *ad hoc* committee to find if any of the information can be updated with new IPM technologies and/or strategies.

Finding lower risk pesticides

When used as labeled, none of the currently labeled pesticides are expected to cause undue harm to humans, of all ages, or the environment. However, understanding the sensitive nature of the school environment means finding effective products with the least risk is appropriate. Each pesticide has unique characteristics that dictate how slowly it will take to degrade in the environment. Figure 6 displays the percentage of pesticide remaining during the course of its degradation for the most commonly reported herbicides on school grounds. Herbicide products containing carfentrazone-ethyl are expected to be mostly eliminated (97.5%) within 2.5 days, while for products containing diquat dibromide that same amount of degradation would take 75 years. Each herbicide's specific exposure determinants (half-life, bioaccumulation potential, ability to volatilize, etc) are listed in Table 11.

Finding products with shorter residence times, lower likelihoods to cling to soil, lower rates of volatilization into the air, and lower likelihood of accumulating in the body are important factors to reducing risk from herbicide applications. In IPM pesticide choice guidelines, products that fit these lower risk profiles are to be selected. Guidance could be developed based on these parameters to help aid in the selection of lower risk herbicide products.

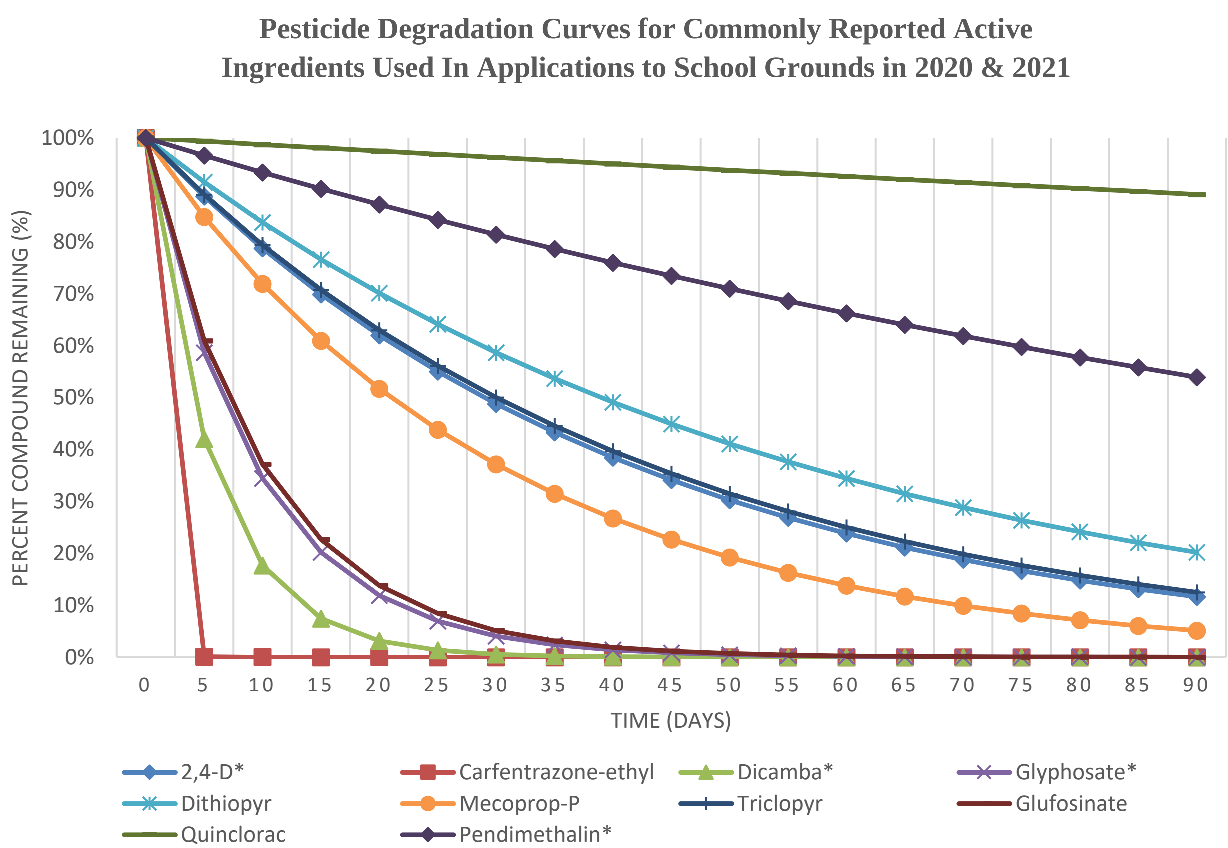


Figure 6. Remaining portion of pesticide following application. Percent remaining is based on soil half-life breakdown rates for commonly reported herbicides on school grounds in Maine.

Decay rates are based off a single value for the acid form, these rates will differ with differences in chemical form (e.g., salt or ester form). The most frequently used were 2,4-D, dicamba, glyphosate, pendimethalin, and triclopyr which are indicated with an asterisk in the legend.

Table 11. Unique environmental fate and transfer attributes for herbicides with registered uses on school grounds in Maine. Values listed are based off a single value for the acid form, values can differ with differences in chemical form (e.g., salt or ester form).Yellow highlighting indicates the three most extreme values in each category (except On-plant half-life because lack of data).

Chemical Name	Volatility[a] - dry (mPa)	Volatility[b] -wet (Pa m3/mol)	Bioconcentration Factor[c]	Fatty Partioning[d] (K_{ow})	Soil half life[e]	On-plant half life	Soil adsorption (K_{oc})	Potential particle transport
2,4-D	Low 0.009	Non-volatile 4.0 x 10-6	Low 10	Low (-0.82)	29 days Field	2.2 days (on)	Mobile 39.3	Low
Carfentrazone-ethyl	Low 7.2 x 10-3	Non-volatile 2.5 x 10-4	Threshold 176	High 3.7	0.5 days Field	5.5 days (on/in)	Slightly mobile 866	Low
Dicamba	Low 1.67	Non-volatile 5 x 10-5	Low 15	Low -1.8	4 days Field	9.5 days (on)	No data	Low
Diquat dibromide	Low 0.01	Non-volatile 5 x 10-12	Low 1	Low -4.6	5,500 days Field	No data	Non-mobile 2,185,000	High
Dithiopyr	No data	No data	No data	High 5.88	39 days Field	3.6 days (on)	Slightly mobile 801	Low
Flumioxazin	Low 0.32	Moderately 0.145	Low	Low 2.55	17.6 days Field	No data	Slightly mobile 889	Low
Fluroxypyr-meptyl	Low 0.01	Non-volatile 2.7 x 10-2	No data	High 5.0	3 days Field	2.7 days (on/in)	Non-mobile 19,550	Low
Glufosinate	Low 3.1 x10-2	Non-volatile 4.5 x 10-9	Low	Low -4.0	7 days Field	No data	Slightly mobile 600	Low
Glyphosate	Low 0.0131	Non-volatile 2.1 x 10-8	Low 0.5	Low -6.3	6.5 days Field	10.6 days (on/in)	Slight mobile 1,424	Medium
Halosulfuron-methyl	Low 3.5 x 10-2	No data	Low	Low -0.02	14 days Field	3.0 days (on/in)	Moderately 109	Low
Indaziflam	Low 2.5 x 10-5	Non-volatile 2.7 x 10-6	Low	Moderate 2.8	150 days Lab	No data	Slightly mobile 1,000	High

Table 11. Continued. Unique environmental fate and transfer attributes for herbicides with registered uses on school grounds in Maine. Values listed are based off a single value for the acid form, values can differ with differences in chemical form (e.g., salt or ester form).Yellow highlighting indicates the three most extreme values in each category (except On-plant half-life because lack of data).

Chemical Name	Volatility[a] - dry (mPa)	Volatility[b] -wet (Pa m3/mol)	Bioconcen-tration Factor[c]	Fatty Partioning[d] (K_{ow})	Soil half life[e]	On-plant half life	Soil adsorption (K_{oc})	Potential particle transport
MCPA	Low 0.4	Non-volatile 5.5 x 10-5	Low 1	Low -0.8	25 days Field	4.2 days (on/in)	No data	Low
Mecoprop-P	Low 0.23	Non-volatile 5.7 x 10-5	Low 3	Low -0.2	21 days Field	No data	No data	Low
Nonanoic acid	High 452	Non-volatile 0.04	No data	Low 2.4	1.3 days Lab	No data	Moderately (K_f 3.25)	No data
Pendimethalin	Low 3.34	Moderately 1.27	High 5,100	High 5.4	101 days Field	12 days (on)	Non-mobile 17,491	High
Prodiamine	Low 0.0033	Non-volatile 8.9 x 10-2	Low	High 4.1	69 days Field	4.6 days (on/in)	Non-mobile 12,710	High
Pyrimisulfan	No data	No data	No data	No data	No data	No data	No data	No data
Quinclorac	Low 0.01	Non-volatile 3.7 x 10-2	Low 0.8	Low -1.15	541 days Lab	3.8 days (on/in)	Mobile 50	Medium
Rimsulfuron	Low 8.9 x 10-4	Non-volatile 8.3 x 10-8	Low	Low -1.5	11 days Field	1.2 days (on/in)	Mobile 50.3	Low
S-Metolachlor	Low 3.7	Non-volatile 2.2 x 10-3	Low 68.8	High 3.1	24 days Field	12 days (on/in)	Moderately (K_f 3.6)	Medium
Sulfentrazone	Low 1.3 10-4	No data	Low	Low 0.99	400 days Lab	No data	Mobile 43	Medium
Topramezone	Low 1.1 x 10-9	Non-volatile 7.1 x 10-14	Low 0.3	Low -1.5	26 Field/ 218 Lab	No data	Moderately 171	Medium
Triclopyr	Low 0.2	Non-volatile 2.9 x 10-3	Low 0.77	Low -0.45	30 days Field	11 days (on/in)	Mobile 27	Low

[a]Volatility from dry surfaces classification: < 5 = Low, 5 to 10 = Moderately, >10 = High

[b]Volatility from wet surfaces classification: < 0.1= Non-volatile, 0.1-100 = Moderately volatile, >100 Highly volatile
[c] Bioconcentration Factor classification: <100= Low, 100 to 5,000 = Threshold for Concern, >5,000 High Potential
[d]Fatty tissue partitioning (K_{OW}) classification: < 2.7 = Low, 2.7 to 3 = Moderate, >3 = High
[e]Soil half-life classification: <30 days = Non-persistent, 30 to 100 =Moderately, >365 = Very Persistent
[f]Particle transport potential: Assigned by calculating half-life and soil mobility (K_{OC})values
Data sourced from: Lewis, K.A., Tzilivakis, J., Warner, D. and Green, A. (2016). An international database for pesticide risk assessments and management. Human and Ecological Risk Assessment: An International Journal, 22(4): 1050-1064. DOI: 10.1080/10807039.2015.1133242 Accessed at: https://sitem.herts.ac.uk/aeru/ppdb/en/atoz_herb.htm

Addendum A—Pesticide Regulations in Maine Schools

In Maine, K-12 schools and nursery schools that are a part of a K-12 school have regulations pertaining to the use of pesticides in and around their facilities. These rules define a school as an elementary, secondary, kindergarten, or nursery school. School buildings are defined as any structure used or occupied by students or staff of any school. Finally, school grounds are defined as any land associated with a school building including playgrounds, athletic fields, and agricultural fields used by students and staff and any other outdoor area used primarily by students or staff including property owned by the municipality or a private entity, with some exceptions, that is regularly utilized for school activities by students and staff. Many of the rules that schools must follow are contained within Chapter 27: Standards for Pesticide Applications and Public Notification in Schools.

Integrated Pest Management

All public and private K-12 schools in the State of Maine must adopt a policy which uses integrated pest management (IPM), a system that uses multiple tactics (cultural, physical, biological, and chemical control) to manage pests that reduces the reliance on chemical pesticides. Regulations stipulate that schools must use IPM to manage, repeal, and control their pests. Chapter 27 (Section 5) outlines the IPM techniques recognized by the Board. This includes conducting pesticide applications in a manner to minimize human risk to the maximum extent practicable using currently available technology**.** All pest management strategies should be conducted in accordance with the Best Management Practices for Athletic Fields & School Grounds, or other BMPs approved by the Board.

IPM techniques include the following baseline measures:

1. Monitor for pest presence or conditions conducive to a pest outbreak;
2. Identify the specific pest;
3. Determine that the pest population exceeds acceptable safety, economic or aesthetic threshold levels; and

Utilize non-pesticide control measures that have been demonstrated to be practicable, effective, and affordable.

IPM Coordinator

In addition to implementing this policy, schools must also appoint a IPM coordinator whose responsibility will be overseeing the policy, monitoring pests and pesticide applications, and making sure all of the requirements for the school is met. IPM coordinators are also charged with the following duties:

1. Complete Board-approved IPM Coordinator overview training within one month of his/her first appointment;
2. Complete Board-approved IPM Coordinator comprehensive training within one year of his/her first appointment;

3. Obtain at least one hour of Board-approved continuing education annually;
4. Maintain and make available to parents, guardians, and staff upon request:
    a. The school's IPM Policy;
    b. A copy of the Board's rules;
    c. A "Pest Management Activity Log," which must be kept current. Pest management information must be kept for a minimum of two years from date of entry (See Record Keeping Requirements).
5. Authorize any pesticide application made in school buildings or on school grounds and complete and sign an entry on the Pest Management Activity Log before or during the date that notification requirements are met; and
6. Ensure that any applicable notification provisions required under this rule are implemented as specified.

Schools must inform the Board of the IPM Coordinator and their contact information by September 1 of each year through a Board approved reporting system.

Notification Requirements

Schools are also required to provide notification, which must be described in the school's policy handbook or manual. When schools are in session, they should provide notice to staff, parents, and guardians with the following information:

1. Trade name and EPA registration number of the pesticides used;
2. The approximate date and time of the application;
3. The location of the application;
4. The reasons for the application; and
5. The name and phone number of the person for inquiries made.

All application notices must be sent at least five days prior to the planned application. Signs must also be posted at each point of access to the treatment area and in common areas at least two working days prior to the application and at least 48 hours following the application. Posted signs have specific regulations regarding their size, font type, wording, and color. For outdoor applications, signs must have the following information:

1. be at least 5 inches wide by 4 inches tall;
2. be made of rigid, weather-resistant material that will last at least ninety-six (96) hours when placed outdoors;
3. bear the Board designated symbol; and
4. state a date and/or time to remove the sign.

Exemptions

Pesticides that are exempt from notification and implementation of rule required IPM pest management techniques include:

1. Ready-to-use general use pesticide that are applied by hand or with non-powered equipment to manage stinging or biting insects;
2. General use antimicrobial products by hand or with non-powered equipment; and
3. Application of paints, stains, and wood preservatives that are classified as general use pesticides.

Pesticides that are exempt from notification include;

1. Pesticides injected into cracks, cervices, or wall voids;
2. Bait blocks, gels, pastes, granular and pelletized materials placed in areas inaccessible to students; and
3. Indoor application of a pesticide with no re-entry or restricted entry interval specified on its label but entry to the treated area is restricted for at least 24 hours.

Additional School Responsibilities
Most IPM Coordinators are not licensed as commercial applicators. Schools contracting for the application of pesticides must ensure the following:

1. Contracted applicators are licensed in the appropriate category or subcategory outlined in Chapter 31: Certification and Licensing Provisions/Commercial Applicator (i.e. 6B general vegetation management, 3B turf); and
2. Outdoor applications should allow for the maximum time for sprays to dry and vapors to dissipate and shall not occur when unprotected persons are in the target areas. Any pesticide application must be conducted in accordance with Board rules to minimize drift and posting of treated sites. Spot treatments should be considered in lieu of broadcast applications.

Commercial Applicator Responsibilities
In addition, commercial applicators also must ensure the following:

1. Applicators are required to obtain written authorization from the IPM coordinator prior to most pesticide applications;
2. Commercial pesticide applicators shall provide IPM coordinators with a written record of the date, time, location, trade name of product applied, EPA registration number, and name of the licensed applicator within one business day of each pesticide application(s); and
3. Commercial applicators must inform the IPM coordinator about any pest monitoring activity and results, this may be achieved by recording them in a Pest Management Activity Log.

Record Keeping Requirements

Schools, typically under the supervision of their appointed IPM coordinator, must maintain a "Pesticide Management Activity Log" that includes: 1) specific name of pests managed and IPM steps taken to manage said pest, and 2) a list of pesticide applications conducted on school grounds, including the date, time, location, trade name of the product applied, EPA Registration number, company name (if applicable) and the name and license number of the applicator. If the product has no EPA Registration number, then a copy of the label must be included. Pest Management Activity Logs must be kept for a minimum of 2 years after entry is made.

In addition, commercial applicators that are contracted by schools also have record keeping and annual reporting requirements. The requirements for commercial applicator record keeping are outlined in The Board of Pesticides Control Rules, Chapter 50: Record Keeping & Reporting Requirements.

Addendum B – Best Management Practices for School Grounds

Adopted by BPC 2/24/2012

Best Management Practices for Athletic Fields & School Grounds

#1 Goal—Reduce human pesticide exposure!

- Minimize pesticide use
- Maintain healthy plants
- Choose pest resistant plant varieties
- Apply spot treatments whenever possible
- Choose products proven to be effective at low application rates
- Choose products that leave little or no residue
- Apply when school is not in session or over extended vacations
- Keep people off treated areas for as long as possible
- Check product label for minimum reentry time

Introduction

In 2011, The Maine Legislature directed the Board of Pesticides Control to evaluate the use of pesticides on school grounds and to develop Best Management Practices (BMPs) for pesticide use with a goal of minimizing human exposure to pesticides. This brochure explains how schools should implement these BMPs. Applying these recommendations should also help schools keep maintenance costs down while improving the safety and appearance of school grounds.

Getting Started

Schools should identify the employees who are involved in school grounds maintenance decisions, including the IPM coordinator, the facilities manager, the athletic director and varsity coaches. The IPM coordinator must be included so that management decisions involving pesticides will be consistent with state law and all notification requirements will be followed.

These grounds maintenance decision makers should assign a Grounds Maintenance Priority Level to all school grounds.* How fields are classified will vary by school and by district, based on use, priorities and available funds.

Assigning Grounds Maintenance Priority Levels

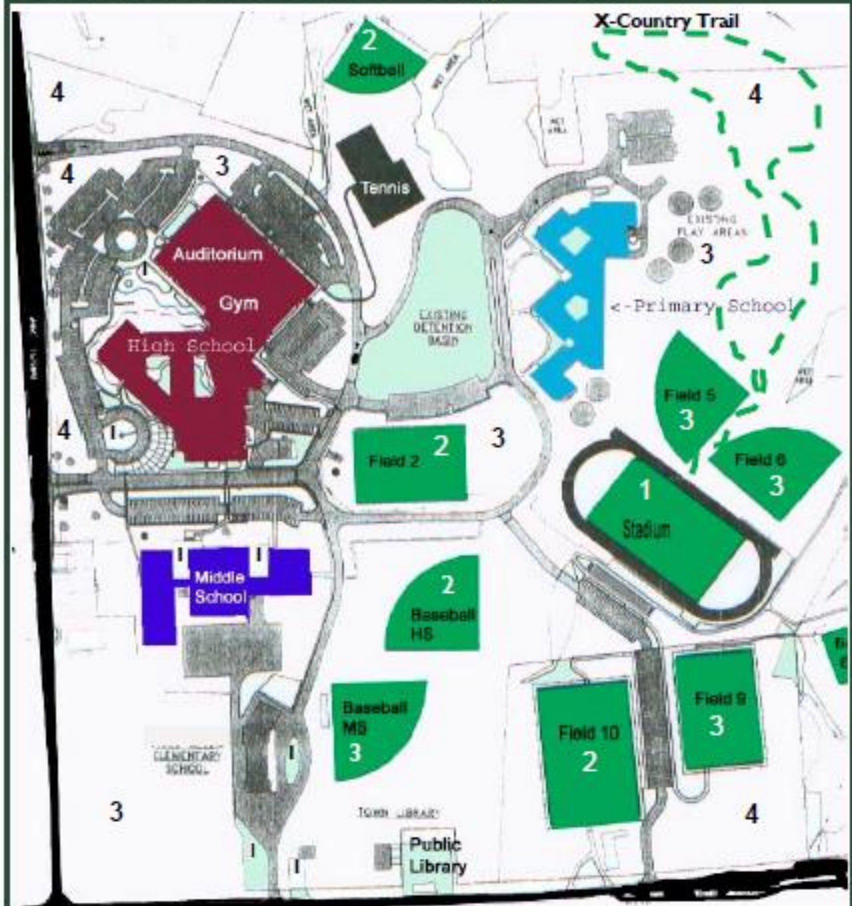
The grounds care BMPs are separated into four levels that roughly correspond to the intensity of use and aesthetic importance of each area. High impact varsity athletic fields may be Level 1 or Level 2. Due to the intensity of use, practice fields that need a high level of maintenance are usually designated Level 2 or 3. Lawn areas and playgrounds generally won't warrant a high level of maintenance and will be assigned to Level 3 or 4. Making a simple map of the maintenance levels for future reference will be helpful to both maintenance personnel and the decision makers (*see map example on opposite side and attached Level-Specific BMPs*).

Other Key Points for Maintaining Quality Grounds and Reducing Risks

- Maintain good communication between staff and contractors involved in grounds maintenance and the IPM coordinator
- Emphasize practices that improve turf density and help minimize need for pesticides
- Identify pests specifically and confirm a pest exceeds threshold levels before authorizing any treatments
- Make sure all pest control products (weed, insect, rodent or plant disease controls) are labeled for use on school grounds and applied by licensed commercial pesticide applicators
- Confirm that all contracts for grounds maintenance services follow these BMPs and the guidelines shown on the opposite side of this bulletin
- Develop a maintenance schedule for the more intensively managed areas so that key steps aren't missed
- Keep detailed records of soil tests, aeration, seeding, top dressing, nutrients and pesticides applied for at least two years

**School grounds means: land associated with a school building including playgrounds, athletic fields and agricultural fields used by students or staff of a school and any other outdoor area used by students or staff including property owned by a municipality or a private entity that is regularly utilized for school activities.*

Grounds Maintenance Priority Levels



Numbers indicate the grounds maintenance priority level

Grounds Maintenance Priority Levels

Level 1—Highest care areas, e.g., some varsity playing fields

Level 2—High care areas, e.g., practice fields or multipurpose fields. May include varsity fields or high visibility lawn areas depending on the school

Level 3—Moderate care areas, e.g., playgrounds, low-use areas, common areas. May include practice fields and some lawn areas depending on the school

Level 4—Lowest care areas, e.g., most lawn areas, natural areas, fence lines, property edges, slopes, utility areas, ditches or trails

Other Important Guidelines

Informed Product Choice

- Read labels and MSDS thoroughly prior to making a choice
- Choose products with proven efficacy at low use rates
- Choose products that pose the lowest exposure potential (watered into the soil, little to no surface residues, low volatility & low drift potential)
- Choose selective products that affect a narrow range of organisms
- Avoid products like weed and feed that require broadcast application

Grounds maintenance contracts should clearly establish:

- The goals of the IPM program
- What services are provided and how they are implemented
- Posting and notification responsibilities
- Consultation with the IPM coordinator
- The population levels of specific pests that can be tolerated without treatment
- Appropriate least-risk procedures to correct pest problems
- The restrictions on pesticide use: types of applications, timing of applications, restricted locations, materials that can be used
- The pest management actions that are the responsibility of the school district

FOR MORE INFORMATION:
Maine Department of Agriculture, Food and Rural Resources

- Maine Board of Pesticides Control
  thinkfirstspraylast.org
- Maine School IPM Program
  thinkfirstspraylast.org/schoolipm

28 State House Station, Augusta, ME 04333-0028 • 207-287-2731

The University of Maine Cooperative Extension
umaine.edu/ipm/
491 College Ave, Orono, ME 04469-5741 • 207-581-3880

The "Level Specific BMPs" can be found at www.maine.gov/agriculture/pesticides/schoolipm/

Adopted by BPC 2/24/2012

Level Specific BMPs for Athletic Fields and School Grounds

	Level 1 – Highest Care	Level 2 – High Care	Level 3 – Moderate Care	Level 4 – Lowest Care
	High impact athletic game fields, e.g. varsity football, soccer, field hockey fields	• Low impact athletic game fields, e.g. baseball, softball • Multipurpose fields • Athletic practice fields	• High visibility lawns • Moderate use areas • Playground fields	• Utility areas, slopes, ditches • Natural areas • Fence lines/property edges • Lawns
Field Use Restrictions	• Whenever possible restrict field use when soils are saturated and surface water is present • If field size allows, move goal areas regularly			
Soil Test	At establishment and before renovation and every 1-3 years when pH needs to be adjusted Every 2 – 5 years otherwise Soil test should determine: • Nutrient levels • pH • Level of compaction • Soil texture and structure (Level 1 only) • Percent organic matter • Thatch depth • Rooting depth		At establishment and before renovation or repair and every 1-3 years when pH needs to be adjusted Every 3 – 5 years other wise • test for nutrient levels and pH	At establishment and before renovation test for nutrient levels and pH
Irrigation for Maintenance of Established Turf	• Supplement rainfall when needed to provide a total of 1" of water per week when grass is actively growing (April – November) • Water turf early in the morning	• As needed to promote active turf growth and prevent summer dormancy • Water turf early in the morning	Only required during renovation or repair, otherwise allow summer dormancy	
Aeration	• 2-6 times/year at a depth of 3-12 inches using a combination of hollow core, solid tine, or shatter aeration • At least one of the aerations should be deep tine or shatter to a depth of at least 8 inches • Intense use areas require the most aeration • Avoid spring aeration when seeding of crabgrass or other summer annuals is a threat	• 1-2 times/year as needed • Use a combination of hollow core, solid tine, or shatter aeration at a depth of 3 – 8 inches • Avoid spring aeration when seeding of crabgrass or other summer annuals is a threat	• Once every two years or as needed • Avoid spring aeration when seeding of crabgrass or other summer annuals is a threat	Never

	Level 1 – Highest Care	Level 2 – High Care	Level 3 – Moderate Care	Level 4 – Lowest Care
Fertilization and Nutrients	• Only apply amendments and nutrients as indicated by soil test, including phosphorus and potassium • Follow soil test recommendations when establishing new seed • Apply N at a rate of 2-4 lbs per 1,000 sq.ft per year in several applications rather than all at once • Fertilize frequently (7 to 10 applications) throughout the season • Apply no more than 0.5 pound of soluble nitrogen per 1,000 square feet per application • Slow release nitrogen (N) fertilizers that are 40-60% water insoluble can be applied at higher rates and less often • Fertilizer rate should be reduced or fertilization eliminated during hot and dry periods unless irrigation is available • Sand based fields may require additional fertilizer • Apply calcitic or dolomitic limestone in spring and/or fall to maintain soil pH within the 6.0 – 6.5 range and to meet soil test requirements for calcium or magnesium	• Only apply amendments and nutrients as indicated by soil test, including phosphorus and potassium • Follow soil test recommendations when establishing new seed • Apply N at a rate of 1-3 lbs per 1,000 sq.ft per year with 2/3 in the fall and 1/3 in the spring • Apply in several applications rather than all at once • Apply no more than 0.5 pound of soluble nitrogen per 1,000 square feet per application • Slow release nitrogen (N) fertilizers that are 40-60% water insoluble can be applied at higher rates and less often • Apply calcitic or dolomitic limestone in spring and/or fall to maintain soil pH within the 6.0 – 6.5 range and to meet soil test requirements for calcium or magnesium	• Only apply amendments and nutrients as indicated by soil test, including phosphorus and potassium • Follow soil test recommendations when establishing new seed • If the turf begins quality is not acceptable, apply N at a rate of 1-2 lbs/1,000 sq.ft per year with 2/3 in the fall and 1/3 in the spring • Apply no more than 0.5 pound of soluble nitrogen per 1,000 square feet per application • Slow release nitrogen (N) fertilizers that are 40-60% water insoluble can be applied at higher rates and less often • Apply calcitic or dolomitic limestone in spring and/or fall to maintain soil pH within the 5.5 – 6.5 range and to meet soil test requirements for calcium or magnesium	• Follow soil test recommendations when establishing new seed • Seldom to never after establishment
Mowing	• Proper mowing height and frequency prevents weeds • Mow to greatest height tolerable for the sport, e.g. 1 to 3 inches depending on type of sport and required playing schedule • Mow to 3 inches or higher during off-season and gradually lower to desired height for play over several mowings • Do not remove more than 1/3 of plant height at each mowing • Keep mower blades sharp • Unless the turf has an active fungal disease or play will be interrupted, return the grass clippings • Use a mulching mower		• Proper mowing height and frequency prevents weeds • Mow to a height of not less than 3 inches • Do not remove more than 1/3 of plant height at each mowing • Keep mower blades sharp • Whenever possible return the grass clippings • Use a mulching mower	• Mow as needed to maintain function of area • Do not remove more than 1/3 of plant height at each mowing when appropriate for the site, use and grasses present • Keep mower blades sharp • Whenever possible return the grass clippings • Use a mulching mower • Utility and low maintenance turf areas need only be mowed in late fall

	Level 1 – Highest Care	Level 2 – High Care	Level 3 – Moderate Care	Level 4 – Lowest Care
Seeding	• Depending on level of management available, athletic fields should be either a 100% blend of Kentucky bluegrass cultivars, or a 100% blend of improved turf-type tall fescue cultivars, or a mix of Kentucky bluegrass and perennial ryegrass • Maintain vegetative cover by repeated seeding any time soil is exposed. This may be 4-8 times/year • Mid-August-early October is ideal timing • Mid-April-early June to repair worn areas • Select hardy, wear-, pest-, and drought-tolerant grass seed species and cultivars including: tall fescues, perennial ryegrass and Kentucky bluegrass • Use a variety of seeding strategies: ▪ Drill seed in 2 to 4 directions ▪ Use pre-germinated seed and sand mix to fill worn areas and divots ▪ Broadcast seed before each game to allow players to "cleat-in" the seed ▪ Broadcast seed prior to dragging aeration cores	• Lawns should be primarily mixtures of fine fescue or tall fescue with limited Kentucky bluegrass or perennial ryegrass • Higher traffic areas should be seeded with mixes that contain a low percentage of fine fescues • Mid-August through early-October as needed • April to repair worn areas or establish new grass areas • Drill seed or broadcast seed and drag in combination with aeration • Select hardy, wear-, pest-, and draught-tolerant grass seed mixture including tall fescues, perennial ryegrass and Kentucky bluegrass	• Lawns should be primarily mixtures of fine fescue or tall fescue with limited Kentucky bluegrass or perennial ryegrass • Higher traffic areas should be seeded with mixes that contain a low percentage of fine fescues • Repair as needed to maintain turf density and prevent erosion • Without irrigation, seed only September to mid-October when adequate moisture is anticipated	• Lawns should be primarily mixtures of fine fescue or tall fescue with limited Kentucky bluegrass or perennial ryegrass • Higher traffic areas should be seeded with mixes that contain a low percentage of fine fescues • Utility areas can be seeded with native conservation grasses, forbs or perennial flowering plants • Repair as needed to maintain turf density and prevent erosion • In September when adequate moisture is anticipated
Seeding continued	• Irrigation is essential during germination and establishment of new seed • Choose seed mixtures based on soil type and intensity of use • Rescue seeding can be done with high quality perennial ryegrass blends • For seed selection use the National Turf Evaluation Program spreadsheet**			
Re-sodding	• Intense use areas, such as soccer goals and between the hash marks on football fields, every 1 to 3 years as needed • Irrigation is essential at installation and during grow-in period	• Intense use areas, such as around pitcher's mound or baseball infields • Irrigation is essential at installation and during grow-in period	Never	Never

**http://apps.hort.iastate.edu/turfgrass/extension/InteractiveNTEPSpreadsheet.xlsm

<table>
<tr><th></th><th>Level 1 – Highest Care</th><th>Level 2 – High Care</th><th>Level 3 – Moderate Care</th><th>Level 4 – Lowest Care</th></tr>
<tr><td>Topdressing</td><td colspan="2">• Apply in combination with aeration to prepare seed bed, modify soil and smooth field
• Use finished composts with low nitrogen and phosphorus content, or
• Use a soil mix that is similar to the existing soil in the root zone
• In all cases avoid forming soil layers which may cause shallow rooting depth and interfere with water movement in the soil</td><td>Never</td><td>Never</td></tr>
<tr><td rowspan="2">Weeds</td><td>• Following the previous BMPs will establish a healthy, thick turf which will outcompete broadleaf weeds
• Depending on weed species present, accept up to 15 - 20% weeds</td><td>• Following the previous BMPs will establish a healthy, thick turf which will outcompete broadleaf weeds
• Depending on weed species present, accept up to 20 - 30% weeds</td><td rowspan="2">• Hand-pull weeds, use a weed whacker or use heat or steam to kill weeds
• Use mulch in flower beds and around landscape plantings to reduce weeds
• Use landscape fabric under playground shock absorption materials
• Depending on weed species present, 50% weeds or more is acceptable in most lawns
• Use broadleaf herbicides only when needed, based on monitoring, to reduce weed populations to acceptable levels
• Use targeted spot treatments whenever possible and avoid broadcast applications</td><td rowspan="2">• Hand-pull weeds
• Use a weed whacker, heat or steam around fences and other structures
• Spray fence lines only when necessary and schedule when students will not be in the area for several days
• Use herbicides to control invasive and noxious plants when necessary
• Use targeted spot treatments whenever possible and avoid broadcast applications</td></tr>
<tr><td colspan="2">• Use broadleaf herbicides only when needed, based on monitoring, to reduce weed populations to acceptable levels
• Use targeted spot treatments whenever possible and avoid broadcast applications
• Coordinate any herbicide use with annual over-seeding program so desirable turf seed is not damaged
• Apply pre-emergent herbicide in spring primarily for crabgrass if needed, based on weed monitoring during the previous year
• Broadleaf weed control every 2-3 years, only as needed
• Broadleaf weed control in spring or fall is more effective, but to reduce student exposure applications may be more acceptable during the summer when school is not in session
• Summer herbicide applications should only be done when the weeds are actively growing
• When weeds are drought stressed, water the area to be treated for a few days prior to herbicide application
• Herbicides should not be applied in temperatures above 85° F to avoid turf damage and reduced efficacy
• Effective post-emergent crabgrass control is available and may be used as an alternative to routine pre-emergent crabgrass applications when areas of crabgrass are limited</td></tr>
</table>

<table>
<tr><th></th><th>Level 1 – Highest Care</th><th>Level 2 – High Care</th><th>Level 3 – Moderate Care</th><th>Level 4 – Lowest Care</th></tr>
<tr><td>Insect Pests
• White Grubs are the larvae of Japanese beetles, May/June beetles, European Chafers, Asiatic garden beetles, Oriental beetles and other scarabs. Turf injury occurs from late July through November and from April - June and is often localized. A site-specific strategy should be practiced

• Action Thresholds for non-irrigated turf (grubs/sq.ft.) Action thresholds may be increased 30% with irrigation
• European chafer: 4 to 6/sq.ft.
• Japanese beetle: 6 to 12/sq.ft.
• Oriental beetle: 6 to 12/sq.ft.
• Asiatic garden beetle: 10 to 20/sq.ft.</td><td>• Monitor July-September
• Beginning of spring and fall sports seasons coincides with peak turf injury from white grubs
• Action threshold levels are species dependent (see cell to left)
• Irrigate as needed to promote grass root growth throughout the growing season
• Insect parasitic nematodes can be very effective when applied properly[%%]
• Consider preventative grub control applications on fields that are infested more than 2 – 3 years in a row</td><td>• Monitor July-September
• Action threshold levels are species dependent (see cell to far left)
• Irrigate as needed to promote grass root growth throughout the growing season
• Action thresholds may be doubled with irrigation
• Insect parasitic nematodes can be very effective when applied properly[%%]</td><td>• Monitor July-September
• Scarab beetles (adult white grubs) often avoid laying eggs in low maintenance non-irrigated turf
• Action threshold levels are species dependent (see cell to far left)
• Action thresholds may be doubled with irrigation
• Insect parasitic nematodes can be very effective when applied properly[%%]</td><td>Pesticide treatment never required</td></tr>
<tr><td>Insect Pests
• Chinch Bugs</td><td colspan="2">• Supplement rainfall when needed to provide a total of 1" of water per week during summer
• Avoid over-fertilizing to prevent thatch build-up. Dethatch and/or core aerate if thatch exceeds ¾ inch
• Pesticide applications only as needed when damage is evident and more than 5-10 chinch bugs per sample using coffee can-float monitoring method[&&]
• If seeding, select resistant, endophytic varieties of tall fescue, perennial ryegrass or fine fescue suitable for athletic fields</td><td>• If seeding, select resistant, endophytic varieties of tall fescue, perennial ryegrass or fine fescue suitable for athletic fields</td><td>• If seeding, select resistant, endophytic varieties of tall fescue, perennial ryegrass or fine fescue suitable for athletic fields</td></tr>
<tr><td>Turf Diseases[@@]
• Brown Patch
• Dollar Spot
• Leaf Spot</td><td colspan="4">• Apply no more than 0.5 pound of quick release nitrogen per 1,000 square feet per application
• Time fertilization and liming to avoid disease critical periods (e.g. avoid fertilization in early spring and just before hot, humid weather)
• Remove dew from fields early in the morning, by dragging with a bar
• Improve air circulation over turf areas
• Irrigate early in the morning only</td></tr>
<tr><td>Turf Diseases[@@]
• Snow Mold</td><td colspan="4">• Avoid fertilizing turf after mid-October
• Continue mowing until growth ceases and gradually increase or reduce mowing height to achieve 2 inches at last mowing
• Overseed with tolerant grasses and resistant cultivars, especially if damage has been severe</td></tr>
</table>

[%%]http://www.yardscaping.org/lawn/documents/Beneficial_Nematodes.pdf

[&&]http://www.gardening.cornell.edu/lawn/lawncare/pestpro.html

[@@]http://extension.umass.edu/turf/publications-resources/best-management-practices

	Level 1 – Highest Care / Level 2 – High Care / Level 3 – Moderate Care / Level 4 – Lowest Care
Other Pests • **Mice, Rats or Other Rodents**	• Seal or fill in all potential nesting sites • Reduce potential food sources by maintaining covered and sealed dumpsters and trash cans • Clean up all food scraps and waste left out by students, staff or visitors • Avoid installation of bird feeders • Compost piles or bins should be inaccessible to rodents
• **Stinging Insects** • **Yellowjackets** • **Wasps** • **Hornets** • **Bees**	• Beginning in early spring, monitor for stinging insect hives or nests and remove before they become established • Fill in abandoned animal dens (including rodent burrows) in areas students use • Seal cracks and crevices within walls of buildings and on play structures • Restrict outdoor eating and drinking in the late summer/fall when yellowjackets are foraging • Keep garbage cans covered • Install stinging insect traps outside of areas that people frequent • Use RTU aerosol sprays in emergency situations
• **European Red Ants** are stinging insects found primarily along the coast. Nests in a variety of habitats including bark mulch, lawns, forested areas, leaf litter, and under rocks and human debris	Contact the University of Maine Cooperative Extension (1-800-287-0279) to confirm suspected infestations and obtain current management recommendations
• **Mosquitoes**	• Eliminate sources of standing water and keep all roof gutters free flowing • When monitoring indicates the potential for mosquito vectored disease, restrict outdoor activities to mid-day • Encourage students, staff and visitors to use insect repellents during activities that expose them to biting mosquitoes • When the Maine CDC determines there is a credible threat for mosquito-borne disease near a school, consider hiring a licensed commercial pest management company to apply mosquito controls
• **Ticks**	• Move all play structures or class areas at least 3 yards away from forest or brushy edges of school yards • Install a 3 foot wide strip of mulch or crushed rock next to any forest or brushy edges of school yards • Do not allow students to walk into forest or brushy areas next to schools • Keep trails cleared to at least a 6 – 8 foot width to prevent students from brushing up against brushy areas • Remove stone walls or other structures that provide harborage for squirrels, mice and other small mammals • Do not feed birds or other animals on school grounds • Encourage students, staff and visitors to use insect repellents during activities that might expose them to tick habitats • Encourage proper attire to prevent ticks from accessing skin areas • Encourage tick checks each time students and staff enter tick habitats • Keep play areas mowed • Avoid any pesticide application to control ticks unless students or staff must frequently use forest or brushy areas that provide suitable deer tick habitat and deer tick numbers are high

	Level 1 – Highest Care	Level 2 – High Care	Level 3 – Moderate Care	Level 4 – Lowest Care
Artificial/Synthetic Turf	• Do not apply disinfectants or sanitizers to the field on a routine basis • Use disinfectants only when necessary to clean up blood/body fluids; follow specific label directions to clean and decontaminate against HIV on surfaces soiled with blood/body fluids • To remove mold, dirt or dust, clean field with detergent and surfactant • To remove small leaves, seeds or other small debris, use leaf blowers, rakes or sweepers, being careful not to displace large amounts of infill material • To remove gum, freeze it with ice cubes or aerosol freezing agents • Inspect all equipment for leaks before operating on the field • Monitor and maintain proper infill depth by topdressing just prior to sweeping and grooming • Follow manufacturer guidelines for sweeping and grooming • Go over the field with a magnet periodically to pick up stray metals • For static, apply wetting agents to the infill • Use extreme care when removing snow or ice from the field so not to move the infill or tear seams • Keep all sources of fire or ignition away from the field surface • Never fill gasoline tanks on the field • Aerate infill materials to maintain G-Max value for every test point at less than 200g's (as measured in accordance with ASTM Standard F355-A and ASTM Specification F1936			

Addendum C–IPM guidance & Resources

School IPM Compliance Checklist

IPM Compliance Checklist for Maine Schools

Requirement	Action	Yes	No
IPM Policy	Has a written IPM policy been adopted?		
	Has the IPM policy been implemented?		
Notice	Is a notice about the school's IPM policy and pesticide use included in the student/parent and staff handbooks?		
	Does the notice include statements of the following?: • That an IPM policy has been adopted • That pesticides may be used periodically • That the school will provide notification of specific pesticide applications • Where records of pest monitoring and pesticide applications may be seen (Pest Management Log) • Where the IPM policy, standards of application and state regulations may be reviewed • Information on how to contact the IPM Coordinator		
IPM Coordinator	Has the school appointed a <u>school employee</u> as the IPM Coordinator?		
	Is the Coordinator responsible for pest monitoring, pesticide applications and all notification activities?		
	Does the Coordinator maintain the following: • A copy of the school(s) IPM policy • A copy of state rule CMR 01-026 Chapter 27 (Standards for Pesticide Applications and Public Notification in Schools) • Current pest management activity log(s) (see below)		
	Has the name and contact information (e-mail address and phone number) of the IPM Coordinator been reported annually by Sept 1 via Department of Education NEO Staff Reporting system?		
	Has the Coordinator completed the required Initial and Comprehensive training and earned 1 hour of IPM continuing education per year?		
Pest Management Activity Log	Does the Pest Management Log have records for at least the preceding 2 years of: • all pest monitoring/sighting records • specific name of pests and IPM steps taken to control them • pesticide applications including date, time, location, trade name of product applied, EPA registration number, company name (if applicable) and name and license of the applicator. • If a product has no EPA Registration number, a copy of the label • IPM Coordinator authorization for all non-exempt applications		
Employee, Parental and Guardian Notification of Pesticide Application	Do notices of pesticide applications include the following? • Trade name and EPA registration number of the pesticide • Approximate date and time of application • Name and phone number for additional information		

School IPM Inspection Checklist

Schools can reduce the likelihood and extent of pest problems through simple procedures and preventative maintenance. The following practices will help keep pests out of school buildings and hinder their establishment, thereby reducing the need for pesticides. *(Modified from IPM Standards for Schools, IPM Institute of North America, www.ipminstitute.org).*

Kitchen and cafeteria

- ❑ Cracks and crevices in walls and floors and around permanent fixtures are sealed.
- ❑ Openings around electrical conduits, pipe chases, and ducts are sealed.
- ❑ Floor drains are covered with screens.
- ❑ Floor drains cleaned regularly with a long-handled brush and cleaning solution.
- ❑ Floor drain traps are kept full of water.
- ❑ Plumbing kept in good repair (no dripping pipes, faucets, or plugged drains)
- ❑ Sewer lines are in good repair.
- ❑ All surfaces and used utensils, trays, and dishes are cleaned and dry by the end of the day.
- ❑ All surfaces in food preparation and serving areas are regularly cleaned of grease deposits.
- ❑ Wiping cloths are disposable or laundered daily.
- ❑ Mops and mop buckets are properly dried and stored (e.g., mops hung upside down, buckets emptied).
- ❑ Overflow water trays in refrigeration units are cleaned and emptied as often as necessary to prevent water leaks.
- ❑ Areas around and under appliances and furnishings that are rarely moved (e.g., refrigerators, freezers, shelving units) are thoroughly cleaned to remove accumulated grease, dust, etc., at least monthly.
- ❑ Purchases of new kitchen appliances and fixtures are of pest-resistant design (i.e., open design, few or no hiding places for roaches, freestanding and on casters for easy thorough cleaning).
- ❑ Out-of-date charts or paper notices are removed from walls monthly.
- ❑ Vending machines maintained in clean condition inside and out.
- ❑ Recyclable containers washed with soapy water before storage or stored refrigerated or in pest-proof containers and regularly moved off-site.
- ❑ Food waste from preparation and serving areas is stored in sealed, leakproof plastic bags before removal from school grounds.
- ❑ Waste with liquid food residues (e.g., milk cartons, juice boxes) are drained of excess moisture before discarding.
- ❑ Weather stripping and door sweeps present and in good condition on exterior doors.

Storage Areas

- ❑ Incoming shipments of food products, paper supplies, etc. are inspected for pests and rejected if infested.
- ❑ Food products delivered in non-pest-proof containers (e.g., paper, cardboard boxes) and not used immediately are stored refrigerated or transferred to pest-proof containers.
- ❑ Packing and shipping trash (bags, boxes, pallets) is promptly and properly disposed of or recycled.
- ❑ Stored products are rotated on a "first in, first out" basis to reduce potential for pest harborage and reproduction.
- ❑ Bulk stored products are not permitted direct contact with walls or floors, allowing access for inspection and reducing pest harborages.
- ❑ Inspection aisles (> 6" x 6") are maintained around bulk stored products.
- ❑ Food storage areas are inspected twice monthly for evidence of pests.
- ❑ Food that has come in direct contact with pests (such as ants, mice, cockroaches, mealworms or other stored product pests) is considered contaminated and is discarded promptly.
- ❑ Shelf paper not used.
- ❑ Paper products are stored separately from food products.

Classrooms, Offices and Hallways, Teachers Rooms

- ❑ Cracks and crevices in walls and floors are sealed.
- ❑ Lockers and desks emptied and cleaned at least twice per year.
- ❑ In elementary schools: sufficient space between coat hooks provided so that each child's hat and coat do not touch those of another child to prevent spreading of head lice.
- ❑ Floors cleaned regularly.
- ❑ Beverage and food containers kept for recycling are washed before storage or sealed in pest-proof container and moved off-site regularly.
- ❑ Food or food wrappers are removed from lockers, desks, teachers rooms daily
- ❑ Potential pest food items used in classrooms (e.g., beans, plant seeds, pet food and bedding, decorative corn, gourds) are refrigerated or stored in glass or metal containers with pest-proof lids.
- ❑ Refrigerators, microwave ovens, and vending machines are maintained in clean condition inside and out.
- ❑ Sink areas kept clean and dry.
- ❑ Food and beverages are allowed only in limited designated areas that are cleaned daily.
- ❑ Materials stored away from walls to allow for regular pest inspection.
- ❑ Waste materials in all rooms within the school building are collected and removed to a dumpster, compactor or designated pickup location daily.
- ❑ Animal wastes from classroom pets or laboratory animals are flushed or placed in sealed containers before disposal.
- ❑ Furniture in classrooms and offices that are rarely moved (e.g., staff desks, bookcases, filing cabinets) receive a thorough cleaning around and under to remove accumulated lint, etc., at least annually.
- ❑ Purchases of new office and classroom furniture that is rarely moved (e.g., staff desks, bookcases, filing cabinets) are of a design that permits complete cleaning under and around the furniture, or ready movement for cleaning purposes.

Restrooms

- ❑ Rooms cleaned and trash removed daily.
- ❑ Drains regularly cleaned with long-handled brush.
- ❑ Cracks and crevices in walls and floors sealed.
- ❑ Plumbing in good repair (no leaks, drips, clogged drains).

Custodial and Maintenance Areas/Duties

- ❑ Tasks requiring cleaning are clearly distinguished from disinfecting tasks and products used for routine cleaning do not contain disinfectants.
- ❑ Cleaning and disinfecting products are stored in secure areas inaccessible to children.
- ❑ Custodial products in aerosol containers are not used except for graffiti-removal products.
- ❑ Mops and mop buckets are properly dried and stored (e.g., mops hung upside down, buckets emptied).
- ❑ Trash/recycling rooms, compactors and dumpsters are regularly inspected and spills cleaned up and leaks repaired promptly.
- ❑ Indoor garbage is kept in lined, covered containers and emptied daily.
- ❑ Packing and shipping waste disposed of promptly.
- ❑ Stored waste is collected and moved off site at least once weekly.
- ❑ Recyclables are rinsed or stored in pest-proof containers and moved off site weekly.
- ❑ Vent or heater filters are cleaned or replaced as per manufacturer's recommended interval or more frequently.
- ❑ The inside of vents and ducts are inspected at least every three years and cleaned by a certified contractor when needed.
- ❑ Moisture sources are corrected (e.g., ventilate areas where condensation forms frequently, repair plumbing, roof leaks, dripping air conditioners).

Pest and Pesticide Risk Management

- ❑ Pesticides (including 'weed and feed' products, mold and mildew control products, disinfectants, rodent baits, ant baits, insecticides, plant disease control products, weed-killers and any other chemical intended to kill living organisms) are never applied in or on school grounds except by persons licensed and certified in the appropriate category by the Maine Board of Pesticides Control except when used for routine cleaning or for emergency protection from stinging insects.
- ❑ No pesticides are applied for pests causing aesthetic damage only.
- ❑ Pest monitoring and pest management records are kept in the school in an accessible location.
- ❑ Lesser risk options for pest management are used first when action is required.

<u>If baits or traps of any kind are used:</u>

- ❑ Each bait station or trap is assigned an identification number
- ❑ A map is prepared showing the location and identification number of each trap or bait placement.
- ❑ Each trap or bait station is marked with appropriate warning language.
- ❑ Bait stations are checked at least monthly
- ❑ Rodent traps are checked daily and captured rodents are removed immediately.
- ❑ All pesticides (including disinfectants) are properly stored in original containers in secured locations according to appropriate hazardous chemical safety protocol (e.g. flammables stored in fire-resistant cabinet, acids stored separately from bases, chlorine-containing chemicals not stored near acids or ammonia)
- ❑ Material Safety Data Sheets (MSDS) and labels for each pesticide and other hazardous chemical are maintained in an accessible location.
- ❑ Pesticides (including disinfectants) inventory is managed to track current stock use and to ensure proper disposal of unused materials and empties.

Outdoors

- ❑ Tree limbs at least 6 ft away from building
- ❑ Vegetation, shrubs, and bark mulch kept at least 12 inches from building.
- ❑ Exterior doors kept shut when not in use.
- ❑ Windows and vents screened or filtered and screens are in good condition.
- ❑ Weather stripping and door sweeps present and in good condition on exterior doors.
- ❑ Building eaves, walls, gutters and roofs are sound. No evidence of water leaks or holes.
- ❑ Cracks in foundation or walls, and openings around conduit, plumbing, and doorways are sealed.
- ❑ Garbage containers, compactors, and garbage storage are placed away from building entrances.
- ❑ Dumpsters placed on hard, cleanable surfaces.
- ❑ Dumpsters have close-fitting lids and are kept closed.
- ❑ Dumpsters are emptied weekly and cleaned regularly.

Maine School Integrated Pest Management Program

Maine Department of Agriculture, Food and Rural Resources

28 State House Station, Augusta, ME 04333

Phone: 207-287-7616. FAX: 207-624-5065

SCHOOL IPM

School IPM Recordkeeping Web Guidance Sheet

IPM Record-Keeping

All Maine schools serving any grades K-12 are required to keep the following information and records, including a **Pest Management Activity Log**. Records must be kept for two years.

Required:

- A copy of **Chapter 27**: Standards for Pesticide Applications and Public Notification in Schools
- School's **IPM Policy**
- A copy of **IPM Policy Notice** stating the name and contact information of the IPM Coordinator, (this Notice should be published in the student/staff policy handbook but keep a copy of it in the Logbook).
- **Training Records** (IPM Coordinator's)
- **Pest Management Activity Monitoring Records**
- **Pest Management Activity Pesticide Notification Records**
- **Pesticide Use Authorization Records**
- **Pesticide Application Records**
- **Pesticide Product Labels** (required for EPA-except pesticides; recommended for EPA registered pesticides)

Optional:

- Facilities IPM **Inspection Records** (regular inspections for pest evidence and pest-conducive conditions)
- Schools' **IPM Plan** (including action and communication plans for common pest issues)
- **Pest Management Service Agreements** (including agreements for buildings, and for lawn/landscape/fields weed and insect control)

Pest Management Activity Log
Page 1—Monitoring/IPM

Use this page for monitoring and general IPM steps taken. Assign a unique number in the last column to reference to Page 2—Trap and Bait Station Monitoring or Page 3—Pesticide Application

Site________________________________(can be building, room, field, playground, etc)

Date/ Time	Pest(s) or Evidence Seen/ Extent of Infestation	Specific Location (under sink, west goal soccer field, etc.)	By Whom	Company	IPM Steps Taken*	Ref.. No. **

**Including monitoring for pest presence or conditions conducive to a pest outbreak, pest identification, and non-pesticide control measures taken*
See Chapter 27 Section 5C
*** Assign a unique Reference Number and match to traps and bait station monitoring on page 2 or a pesticide application on page 3.*

Pest Management Activity Log
Page 2—Trap and Bait Station Monitoring

Use this page when Traps and Bait Stations are used. The Reference number should connect to the last column on Page 1—Monitoring/IPM.

Site______________________________(can be building, room, field, playground, etc)

Ref. #	Trap Type	Room # or Name	Location Description	Date Trap Checked	Trap Missing?	# of Specimens

Pest Management Activity Log
Page 3—Pesticide Application

Use this page when pesticide applications are necessary. Use the chart to determine if authorization, notification and/or signage is required. The Reference Number refers to a matching pest sighting entry on Page 1—Monitoring/IPM in the logbook.

Site____(can be building and room, field, playground, etc)

Reference Number from Monitoring/IPM page ________________

1) What is the pest? How was the pest identified?

2) How was it determined that a pesticide application was necessary? Include information about the safety, economic or aesthetic threshold reached (see Chapter 27 section 5C)

3) Application information:

Date/Time ______________________________ Applicator Name ______________________________

Product Trade Name ______________________________ Applicator License # ________________________

EPA Reg # ______________________________ Company ______________________________

Specific Location (under sink in room 100, west goal JH soccer field, etc) ______________________________

4) Identify the type of application from the chart and continue to the required sections below.

Check one	*See BPC Chapter 27 Section 3 for details about specific pesticide applications*	**IPM coordinator authorization**	**5 day prior notice to parents, guardians, staff**	**Signs posted 2 days prior to application**
	For urgent control of stinging or biting insects	required (go to 5)	NA	NA
	General use antimicrobial products for cleaning	NA	NA	NA
	Paints, stains or wood preservatives	NA	NA	NA
	Injected into cracks, crevices or wall voids	NA	NA	NA
	Bait blocks, gels, pastes, granular and pelletized materials in areas inaccessible to students	NA	NA	NA
	Indoor application with no re-entry or restricted entry interval, but entry is restricted for at least 24 hours	NA	NA	NA
	Mosquito control when Maine CDC has identified arbovirus positive animals in the area	NA	NA	required (go to 7)
	In facilities used for agricultural or horticultural education (see Chapter 27 section 3D)	NA	NA	required (go to 7)
	Any other applications made while school is **not** in session*	required (go to 5)	NA	required (go to 7)
	Any other application made while school is in session*	required (go to 5)	required (go to 6)	required (go to 7)

(Use the chart above to determine which of the following are required. For further clarification consult BPC Chapter 27)

5) Authorization by IPM coordinator ____
signature date

6) Date notification sent to parents, guardians and staff: ______________________________

7) Date and locations of signs posted: ______________________________________

*School is considered to be in session during the school year including weekends. School is not considered to be in session during any vacation of at least one week.

Revised 5/15/15

School IPM Disinfection Activity Log

Date	Start Time	Finish Time	Location/Site of Treated Area	Size of Treated Area	Target Pest	Amount Pesticide(s) & Diluent Applied	Rate Description			Application Method	Product Trade Name & EPA Registration Number
							Undiluted	Mix	Mix Ratio		
9/1/2020	*7:00am*	*7:35am*	*All west corridor classrooms and breakroom*	*2500 ft^3*	*Sars-Cov-2 (Covid-19)*	*1.25 quarts*	*1.25 quarts*	*N/A*	*N/A*	*Electrostatic sprayer at 40 micron setting*	*Vital Oxide 82972-1*

Operating Standards, *Application*, continued

- Use a drop spreader instead of rotary type spreader near sensitive areas.
- Leave a minimum twenty-five-foot buffer zone of untreated grasses or other vegetation around water bodies or areas that lead directly to them, i.e., streams, rivers, lakes, estuaries, bays, coastal areas, vernal pools, wetlands, culverts, storm drains, or drainageways, etc. and around wellheads.
- Manage pest problems with spot applications—avoid broadcast applications.

Customer/Neighbor Relations

Notification

- Remind the customer annually about their right to request copies of pesticide and fertilizer labels and Material Safety Data Sheets.
- When requested, always provide copies of pesticide labels and Material Safety Data Sheets prior to application of pesticides or fertilizers.
- When requested, always notify customers and/or neighbors at least 24 hours before any pesticide application.
- After application, always inform customers about the treatment, e.g., fertilizer, insect control, weed control, disease control, etc.
- Assure that customers know when they must water in fertilizer or pesticide applications and how much water to apply
- Assure that customers and/or neighbors are aware of the reentry period for any pesticide application.

Customer Education

The BPC believes that customer education is the foundation for informed decision-making regarding the application of pesticides and fertilizers to turf grass areas. It often is the key to customer satisfaction. Customers and mowing or irrigation contractors often control factors that are critical to the success of any turf management program. The need for, and/or efficacy of, applied materials is either enhanced or diminished by customer decisions and practices.

Customers must know when their expectations may be too high and when their cultural practices are affecting the health of their turf. Therefore, prior to using fertilizers and pesticides, practitioners must inform and educate their customers about proper lawn maintenance (www.yardscaping.org/lawn/index.htm) and the following topics:

- soil depth and texture
- soil pH and nutrient imbalances
- grass species selection in relation to soil and shade conditions and intensity of use
- grass species selection in relation to fertilizer need and pest resistance
- proper mowing height and frequency, mower maintenance, and clipping management
- proper watering techniques
- soil compaction or thatch development problems
- need for buffers around wells and water bodies
- options for use of low-risk controls, e.g., natural, biological, mechanical, or physical controls
- options for use of composts or other slow-release fertilizers
- options for use of phosphorus-free fertilizers

Turf Best Management Practices Committee Members

Mary Ellen Dennis, Maine DEP
Mary Gilbertson, Portland Water District
Dan Holmquist, Lucas Tree Experts
Patricia Ianni, Portland, Maine (Public Member)
John Jemison, Water Quality and Soil Specialist, University of Maine (BPC Board Member)
Jesse O'Brien, Down East Turf Farms
Harris Parnell, Toxics Action Center
Charles Ravis, Country Club Lawns
Dan Simonds, Forester, SGS North America (BPC Board Member)

Comments or Questions? Contact Gary Fish, Manager, Pesticide Programs, 207-287-7545, or e-mail gary.fish@maine.gov.

Best Management Practices for the Application of Turf Pesticides and Fertilizers

Recommendations of the Turf Best Management Practices Committee—Spring 2009

Why Best Management Practices?

Studies confirm that loss of pesticides to ground and surface waters continues to threaten water resources in the Northeast.[1] Applying pesticides to saturated lawns or when wet weather is predicted greatly increases the risk of loss. It is evident that lawn care companies and homeowners need to better understand the risks of applying fertilizers and pesticides under unfavorable conditions to slopes, drainage areas, storm drains, saturated soils, near wells or just prior to heavy rain events. In 2005, despite these known risks, some Maine lawn care companies made hundreds of applications during a week when it rained over 3 inches, and this was preceded by a five-week period when more than 8½ inches of rain was recorded.

Because of these inappropriate practices, the Maine Board of Pesticides Control (BPC) convened a committee to develop these Best Management Practices (BMPs). Heavy rains can easily wash away applications of fertilizers and pesticides from turf areas and move them into our precious and still somewhat pristine water resources. Surface water sampling done by Friends of Casco Bay has detected multiple herbicides and at least one insecticide and fungicide in waters leaving Southern Maine residential developments.[2] Some of the concentrations found in these samples have exceeded aquatic life criteria, violating State and Federal water quality law and may be adversely impacting aquatic invertebrates and fish species. Industry professionals and the BPC agree these BMPs will improve the practices of commercial lawn care operations, golf course superintendents, athletic field managers, sod growers, and home lawn enthusiasts.

Adding to this concern is the dramatic increase in distribution and use of lawn and garden pesticides in the State of Maine. BPC distribution and use reports show a sharp rise from 800,000 pounds in 1995 to 3,000,000 pounds in 2004.[3] Most of this material was a combination of fertilizers and pesticides (weed & feed products) applied to residential and commercial lawns. Another purpose for these BMPs is to demonstrate the BPC's desire for turf managers to minimize reliance on pesticides.

The Board recognizes that homeowners who apply pesticides under unfavorable conditions can also threaten water quality. But, our hope is the use of these BMPs by commercial lawn care operators, golf course superintendents, athletic field managers, and sod growers will help reach the ultimate goal of reducing human and environmental risks and set the example for do-it-yourselfers.

[1]USGS Circular 1291 and Friends of Casco Bay surface water sampling results.
[2]Friends of Casco Bay surface water sampling results.
[3]Data derived from sales and distribution reports provided by pesticide manufacturers and distributors and commercial applicator summary reports provided annually to the Maine Board of Pesticides Control.

Recommended BMPs

Site Assessment

Initial Site Visit

- Determine customer expectations.
- Assess weed, insect, or disease problems to determine pest management needs.
- Make a site plan showing turf areas and determine square footage to be treated.
- Determine soil texture and structure, thatch depth, rooting depth, compaction, and erosion
- Do a soil test on new sites to determine Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg) levels, pH, and Cation Exchange Capacity.
- Note presence of sensitive areas on and off site, e.g., sandy/gravelly soils, shallow water table, drinking water wells, surface water storm drains, etc. Observe slope/grade, culverts and storm drains to determine where water runs off turf area.
- Determine grass species mix.
- Evaluate intensity of use.
- Note turf sun exposure.
- Keep records including the assessor's name and date of assessment.

Turf Assessment Prior to Treatment

- Check soil conditions, e.g., compaction, erosion, frozen ground, shallow soils, exposed ledge or bedrock, saturated with water, etc.
- Identify incidence and severity of weed, insect, or disease problems.
- Determine current health of turf.
- Determine watering frequency and intensity.

Thorough Periodic Assessments

- Annually
  - Reassess the criteria under the initial site visit (*see above*).
  - Check customer expectations.
  - Assure customer still wants the service.
  - Review records of all management measures.
- Every Three to Five Years
  - Test soil pH and nutrient levels.
  - Consider monitoring ground water for nitrates and pesticides at golf courses, sod farms, or other intensively managed areas.

Informed Product Choice

Pesticides

- Read labels and Material Safety Data Sheets thoroughly prior to making a choice.
- Choose least-toxic and least-persistent products with the lowest exposure potential.
- Choose products with the lowest pesticide leaching potential.[4]
- Choose products with the lowest pesticide solution runoff potential.[4]
- Choose products with the lowest pesticide adsorbed runoff potential.[4]
- Choose products with the lowest exposure adjusted toxicity for humans (EATHuman).[4]
- Choose products with the lowest exposure adjusted toxicity maximum acceptable toxicant concentration for fish (EATMATC).[4]
- Choose products with the lowest exposure adjusted toxicity sediment toxicity value for fish (EATSTV).[4]
- Choose products that are not highly toxic to bees or other pollinators.
- Choose products that are selective and that affect the narrowest range of organisms.
- Choose products that are separate from fertilizers and that can be used for spot treatments.
- Choose products with low drift potential and low volatility.

[4]See separate Windows Pesticide Screening Tool chart or go to www.thinkfirstspraylast.org/turf_bmps/index.htm.

Fertilizers

- Choose fertilizers with slow- or timed-release nitrogen, e.g., WIN (water insoluble nitrogen), resin-coated urea, methylene ureas, or composted organic materials.
- Do not apply slow- or timed-release nitrogen at rates above 1 pound per 1,000 square feet.
- Avoid inorganic fertilizers, e.g., ammonium nitrate, calcium nitrate, or ammonium sulfate.
- Do not apply quick-release nitrogen at rates above ½ pound per 1,000 square feet.
- Use phosphorus-free fertilizer, unless a soil test indicates a low phosphorus level, or when establishing a new lawn from seed.

Operating Standards

Prior to Application

- Check for presence of people or pets.
- Check for sensitive individuals nearby, e.g., daycare, nursing home, school, hospital, etc.
- Check for presence of non-target articles, e.g., toys, sandboxes, pet dishes, etc., and remove from treatment area or cover.
- Check for open windows in areas adjacent to treatment and have them closed.
- Check 24-hour weather forecast.
- Record current weather conditions.
- Calibrate application equipment frequently.

Application

- Base nutrient and pesticide applications on soil structure, conditions, pH, and existing nutrient levels.
- Never apply fertilizer or pesticides when there is standing water on any part of the area to be treated.
- Never apply fertilizer or pesticides to saturated soils.
- Never apply fertilizer or pesticides to frozen ground.
- Never apply pesticides when surface temperatures exceed 85 degrees Fahrenheit.
- Follow any other label requirements regarding maximum surface temperatures.
- Never apply fertilizer or pesticides until the turf naturally greens up in the spring (approximately 50–55 degrees Fahrenheit at a three-inch soil depth).
- Do not apply fertilizer or pesticides between December 1 and April 1 (except for fungicide applications to control snow mold diseases).
- Always consider weather forecasts for moderate to heavy rain and its effect on efficacy and potential environmental contamination.
- Avoid applying liquid products using powered application equipment when wind speeds are below 3 miles per hour or exceed 10 miles per hour.
- Do not apply pesticides if rain or irrigation is imminent, unless specified by the label.
- Do not apply fertilizer or pesticides if moderate to heavy rain is imminent, regardless of label statements.
- Never apply fertilizers or pesticides to impervious surfaces, e.g., compacted paths, eroded areas, steep slopes, asphalt, or other paving materials.
- Never apply fertilizer or pesticides near areas that are prone to runoff, i.e., culverts, storm drains, drainageways, etc. or near wellheads.
- Never apply fertilizers or pesticides to bare ground, unless it is to help establish new seed.
- Cover seeded areas with straw or another appropriate mulch to prevent erosion.
- Always clean up spills or misapplied product immediately.
- Never leave misapplied products on driveways, roads, sidewalks, or other hard surfaces.
- To reduce nitrogen or phosphorus loss, assure that fertilizers are lightly watered in (¼–½ inch) following application.
- When the label directs, assure that pesticides are watered in as directed.
- Always fill fertilizer spreaders on a hard surface, where any spills can be easily cleaned up.

Addendum D–Literature Review on School Herbicide Use & IPM

A literature review submitted to the MAC by Dr. H. Peterson IPM Specialist for the Department of Agriculture, Conservation, & Forestry

Turfgrass Weeds and Athlete-Surface Interactions

The management of turfgrass for athletic fields is a complex process for field managers, and is of the utmost importance, as the quality of fields can impact rates of injuries to athletes. While we are likely to only perceive the surface level visuals of turfgrass, it is a complicated plant community and ecosystem. Several factors including the species and cultivar of turf, the density of biomass, the current level of ground cover, the height of cut, and the root biomass all contribute to its level of wear tolerance and ability to recover from damage (Aldahir & McElroy, 2014). Damage and compaction to turfgrass can be directly impacted by the level of pathogens, pests, and weeds (Aldahir & McElroy, 2014), so it is essential to have a plan in place to retain good quality playing fields. Integrated Pest Management (IPM) is a proven method for reducing weed coverage in turfgrass using cultural and mechanical practices alongside infrequent herbicide treatments. In a recent study, field plots in New England were compared using eight different management practices including IPM, calendar-based herbicide treatments, organic, and no-herbicide treatments. IPM had the best balance between good field quality (with a lower percent weed cover than all organic or non-pesticide treatments) and lowest environmental impact (environmental impact quotient (FUEIQ)) out of the treatments that included herbicides (Maxey 2019).

Oftentimes, damage to turfgrass can be easily recognized through spots of missing grass. The Sports Turf Managers Association states that "when the turf coverage drops below 75%, playability and safety start to become compromised," Weeds often do not handle wear and tear well, causing both an immediate and long-term decrease in stable footing. Straw et al. 2020 compared twenty-three ground-derived injuries, and injury occurrence was significantly higher in areas of low turfgrass quality and high soil moisture. Other metrics often measured for determining field quality and safety of turfgrass playing fields include surface hardness, turfgrass quality, soil moisture, traction, and surface evenness (Straw et al 2020). It can be challenging for athletic fields to achieve the right balance between hardness and softness for shock absorption that does not cause cartilage damage, but also does not cause leg-muscle fatigue (Popke, 2002). Brosnan et al. (2014) compared green cover, surface hardness, and rotational resistance after simulated traffic events on field plots with monostands of weed-free bermudagrass or weeds (crabgrass or white clover). Plots with weeds demonstrated less green cover (100% loss after 10 simulated events), increased surface hardness (48-52%), and decreased rotational resistance, which likely would translate to a lack of traction. This is alarming, as changes in surface traction can increase ACL injuries (Aldahir & McElroy, 2014).

In Maine, schools are required to follow IPM methods for turfgrass, along with all other pest management on property, per Chapter 27 (Standards for Pesticide Applications and Public Notification in Schools) of the Board of Pesticides Control within the Code of Maine Rules. Several resources are available online for schools regarding turfgrass IPM. The *Maine School IPM Fact Sheet for Athletic*

Fields provides best management practices for Maine playing fields. Techniques include irrigation, mowing, soil testing, fertilization, aerification, overseeding, scouting for pests and weeds, and cultural controls such as limiting play when a field is wet. The *Maine School IPM Fact Sheet on Weed Management* provides an overview of best management practices for weeds; specifically, several cultural controls that should be exhausted before using chemical control. Finally, the detailed *Best Management Practices for Athletic Fields & School Grounds* provides comprehensive instructions for athletic field and school ground management in Maine. A ranking system of field use importance along with many non-pesticide options to employ aids managers in complying with IPM regulations.

Per the *Best Management Practices for Athletic Fields & School Grounds* documentation, herbicides are one tool in the large kit for managers. Schools are required to only use herbicides when needed based on monitoring and for spot treatments. In 2020 and 2021 thus far, most schools applied herbicides two times or less per year, with a few outlier schools with higher numbers of applications. Active ingredients most used were 2,4-D and triclopyr or Glyphosate. Most applications in 2020 occurred in May and June, and from May-August in 2021. Per Chapter 27, "applications should be planned to occur on weekends or vacations to allow maximum time for sprays to dry and vapors to dissipate." It is important to recognize and consider that weeds have developed resistance to many classes of herbicides already (Brosnan et al. 2020), and it is important to keep options in the treatment toolkit for rotation of classes of herbicides in order to reduce the potential for more resistance to develop.

In other states, the banning of herbicides has complicated management programs, especially for lower income schools. Portmess et al. (2012) conducted a study at a New York high school one year after all pesticides were banned on turfgrass (NY Child Safe Playing Fields Act). In areas of concentrated play, there was heavy soil compaction (higher CIV rating), increased levels of bare and thin turf, and more weeds. An alternative management plan was created and was successful in remediating a lot of these problems but was most likely to be inhibitory from a cost perspective. Bartholomew et al. (2015) surveyed grounds managers at K-8 schools in Connecticut after a pesticide ban caused schools to move from IPM programs to pesticide-free. The survey included questions about if there had been changes in the budget allotted for these changing practices, evaluation of their changes in pest management practices, and demographic and education levels of the manager. With the move from IPM to pesticide free, 68% of the managers reported increased expenses with a decreased perception in quality of fields. No managers reported an increase in quality, and managers who had worked longer in their positions were less likely to adopt the newer needed cultural practices. IPM of turfgrass has been successful in Maine, and the reduction of available tools could be challenging for school budgets and grounds managers.

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Addendum E– Regulatory documentation and categorizations for herbicides used on school grounds

Table E.1. EPA Office of Pesticide Program's (OPP) Cancer Classification for Herbicides Currently Registered for Use on School Property in Maine. Descriptions of the classification follows on the next table.

Chemical Name	EPA OPP Cancer Ranking	Reference
2,4-D	Group D - Not classifiable as to human carcinogenicity / Not likely to be carcinogenic to humans.	EPA 2017 a
Carfentrazone-ethyl	Not likely to be carcinogenic to humans.	EPA 2015 a
Dicamba	Not likely to be carcinogenic to humans.	EPA 2016
Diquat dibromide	Group E - Evidence of non-carcinogenicity for humans.	EPA2015 b
Dithiopyr	Group E - Evidence of non-carcinogenicity for humans.	EPA 2020 a
Flumioxazin	Not likely to be carcinogenic to humans.	EPA 2020 b
Fluroxypyr-meptyl	Not likely to be carcinogenic to humans.	EPA 2018 a
Glufosinate	Not likely to be carcinogenic to humans.	EPA 2012 b
Glyphosate	Not likely to be carcinogenic to humans.	EPA 2017 b
Halosulfuron-methyl	Not likely to be carcinogenic to humans.	EPA 2015 c
Indaziflam	Not likely to be carcinogenic to humans.	EPA 2010
MCPA	Not likely to be carcinogenic to humans.	EPA 2020 c
Mecoprop-P	Suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential.	EPA 2007 a
Nonanoic acid	No data	
Pendimethalin	Group C - Possible human carcinogen.	EPA 2017 c
Prodiamine	Group C - Possible human carcinogen.	EPA 2018 b

Table E.1 Continuted. EPA Office of Pesticide Program's (OPP) Cancer Classification for Herbicides Currently Registered for Use on School Property in Maine. Descriptions of the classification follows on the next table.

Chemical Name	**EPA OPP Cancer Ranking**	**Reference**
Pyrimisulfan	No data	
Quinclorac	Group D - Not classifiable as to human carcinogenicity / Not likely to be carcinogenic to humans.	EPA 2007 b
Rimsulfuron	Not Likely To Be Carcinogenic To Humans.	EPA 2015 d
S-Metolachlor	Not likely to be carcinogenic to humans.	EPA 2019 a
Sulfentrazone	Not likely to be carcinogenic to humans. / Group E - Evidence of non-carcinogenicity for humans.	EPA 2014
Topramezone	Not likely to be carcinogenic to humans: At Doses That Do Not Alter Rat Thyroid Hormone Homeostasis.	EPA 2012 c
Triclopyr	Group D - Not classifiable as to human carcinogenicity	EPA 2019 b

Cancer listings also available at http://npic.orst.edu/chemicals_evaluated.pdf

Table E.2. EPA's cancer classification descriptions. The cancer category labels are not easily interchanged from one system to the other and are presented here for clarification.

Understanding EPA Cancer Classifications Over Time
2005 classification
Carcinogenic to humans.
This descriptor indicates strong evidence of human carcinogenicity. It covers different combinations of evidence.
Likely to be carcinogenic to humans.
This descriptor is appropriate when the weight of the evidence is adequate to demonstrate carcinogenic potential to humans but does not reach the weight of evidence for the descriptor "Carcinogenic to Humans." Adequate evidence consistent with this descriptor covers a broad spectrum. As stated previously, the use of the term "likely" as a weight of evidence descriptor does not correspond to a quantifiable probability.
Suggestive evidence of carcinogenic potential.
This descriptor of the database is appropriate when the weight of evidence is suggestive of carcinogenicity; a concern for potential carcinogenic effects in humans is raised, but the data are judged not sufficient for a stronger conclusion. This descriptor covers a spectrum of evidence associated with varying levels of concern for carcinogenicity, ranging from a positive cancer result in the only study on an agent to a single positive cancer result in an extensive database that includes negative studies in other species. Depending on the extent of the database, additional studies may or may not provide further insights.
Inadequate information to assess carcinogenic potential.
This descriptor of the database is appropriate when available data are judged inadequate for applying one of the other descriptors. Additional studies generally would be expected to provide further insights.
Not likely to be carcinogenic to humans.
This descriptor is appropriate when the available data are considered robust for deciding that there is no basis for human hazard concern. In some instances, there can be positive results in experimental animals when there is strong, consistent evidence that each mode of action in experimental animals does not operate in humans. In other cases, there can be convincing evidence in both humans and animals that the agent is not carcinogenic.
1986 classification
Group A - Human carcinogen.
This group is used only when there is sufficient evidence from epidemiologic studies to support a causal association between exposure to the agents and cancer.
Group B - Probable human carcinogen.
This group includes agents for which the weight of evidence of human carcinogenicity based on epidemiologic studies is "limited" and also includes agents for which the weight of evidence of carcinogenicity based on animal studies is "sufficient."

Table E.2 Continued. EPA's cancer classification descriptions. The cancer category labels are not easily interchanged from one system to the other and are presented here for clarification.

Understanding EPA Cancer Classifications Over Time
Group B1 is reserved for agents for which there is limited evidence of carcinogenicity from epidemiologic studies.
Group B2 is used for Agents for which there is "sufficient: evidence from animal studies and for which there is "inadequate evidence" or "no data" from epidemiologic studies.
Group C - Possible human carcinogen.
This group is used for agents with limited evidence of carcinogenicity in animals in the absence of human data.
Group D - Not classifiable as to human carcinogenicity.
This group is generally used for agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.
Group E - Evidence of non-carcinogenicity for humans.
This group is used for agents that show no evidence for carcinogenicity in at least two adequate animal tests in different species or in both adequate epidemiologic and animal studies.

https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/evaluating-pesticides-carcinogenic-potential#terms

Table E.3. EPA Human Health Risk Assessments for Herbicides Allowed for Use on School Grounds. EPA Office of Pesticide Program's risk assessment documents are available as part of the Federal Register (regulations.gov). Within each pesticide's docket the following documents were reviewed.

References

	Title of EPA Docket Registration Document on Regulations.gov
EPA 2017 a	2,4-D. Revised Human Health Eisk Assessment for Registration Review
EPA 2015 a	Carfentrazone-Ethyl: Human Health Risk Assessment in Support of Application to Globe Artichoke, Asparagus, Mint, Psyllium, Quinoa, and Teff and Updates to Several Crop Group (CG) or Subgroup (CSG) Designations.
EPA 2016	Dicamba. Human Health Risk Assessment for Proposed Section 3 New Uses on Corn
EPA 2015 b	Diquat Dibromide - Draft Human Health Risk Assessment for Registration
EPA 2020 a	Dithiopyr: Revised Human Health Risk Assessment for Registration Review.
EPA 2020 b	Flumioxazin: Addendum Registration Review Human Health Risk Assessment in Support of the Preliminary Interim Decision
EPA 2018 a	Fluroxypyr: Draft Human Health Risk Assessment for Registration Review
EPA 2012 b	Glufosinate ammonium. Updated Human Health Risk Assessment for the Proposed New Use…
EPA 2017 b	Glyphosate. Draft Human Health Risk Assessment in Support of Registration Review.
EPA 2015 c	Halosulfuron-Methyl. Human Health Draft Risk Assessment for Registration Review
EPA 2010	Indaziflam: Human Health Risk Assessment for Use in Citrus, Stone, and Pome Fruits; Grapes; Tree Nuts; Pistachios; Olives; and Sugar Cane (Imported Refined Sugar).
EPA 2020 c	MCPA. Second Revision: Draft Human Health Risk Assessment in Support of Registration Review.
EPA 2007 a	MCPP-p (acid), MCPP-p DMAS, & MCPP-p potassium salt: HED Preliminary Human Health Risk Assessment
EPA 2017 c	Pendimethalin - Draft Human Health Risk Assessment to Support Registration Review
EPA 2018 b	Prodiamine – Draft Human Health Risk Assessment for Registration Review
EPA 2007 b	Quinclorac Human Health Risk Problem Formulation

Table E.3 Continued. EPA Human Health Risk Assessments for Herbicides Allowed for Use on School Grounds. EPA Office of Pesticide Program's risk assessment documents are available as part of the Federal Register (regulations.gov). Within each pesticide's docket the following documents were reviewed.

	Title of EPA Docket Registration Document on Regulations.gov
EPA 2015 d	Rimsulfuron. Human Health Draft Risk Assessment for Registration Review.
EPA 2019 a	Metolachlor and S-Metolachlor: Draft Human Health Risk Assessment for Registration Review
EPA 2014	Sulfentrazone- Preliminary Human-Health Risk Assessment for Registration Review and the Risk Assessment for the Section 3 Registration Request for a New Use on Apples
EPA 2012 c	Topramezone Human Health Risk Assessment for Proposed Uses on Golf Courses, Sod Farms, and Residential Turfgrass
EPA 2019 b	Triclopyr, Triclopyr Butoxyethyl Ester, and Triclopyr Salts. Human Health Draft Risk Assessment to Support Registration Review

Table E.4. California's Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986) Classifications for Herbicides Currently Registered for Use on School Property in Maine

California Proposition 65 List			
Chemical Name	**Basis (Year Determined)**	**Safe Harbor Levels**	**Basis for Listing**
2,4-D (2,4-D butyric acid)	Developmental Toxicity (06/18/1999) Male Reproductive Toxicity (06/18/1999)	Maximum Allowable Dose Level (MADL): 910 µg/day Equivalent to 31.4 µg/kg/day for a child aged 6 to 11 years	US EPA
Carfentrazone-ethyl			
Dicamba			
Diquat dibromide			
Dithiopyr			
Flumioxazin			
Fluroxypyr-meptyl			
Glufosinate			
Glyphosate	Cancer (07/07/2017)	No Significant Risk Level (NSRL): 1,100 µg/day	IARC
Halosulfuron-methyl			
Indaziflam			
MCPA			
Mecoprop-P			
Nonanoic acid			

Table E.4 Continued. California's Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986) Classifications for Herbicides Currently Registered for Use on School Property in Maine.

California Proposition 65 List			
Chemical Name	**Basis (Year Determined)**	**Safe Harbor Levels**	**Basis for Listing**
Pendimethalin			
Prodiamine			
Pyrimisulfan			
Quinclorac			
Rimsulfuron			
S-Metolachlor			
Sulfentrazone			
Topramezone			
Triclopyr			
https://oehha.ca.gov/proposition-65/proposition-65-list			

Table E.5. Pesticide Registration Status in the EU. The European Union is often looked to for validation of chemical actions because of implementation of the REACH legislation which incorporates aspects of the "precautionary principle". Herbicides with registered uses on school grounds in Maine are compared to EU overarching authorization and member state authorizations. Country codes in table that follows.

Chemical Name	Member State Authorizations
Approved in EU	
2,4-D	AT, BE, BG, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SI, SK
Carfentrazone-ethyl	AT, BE, CZ, DE, EE, EL, ES, FI, FR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, SE, SK
Dicamba	AT, BE, BG, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SI, SK
Flumioxazin	AT, BE, BG, CZ, DE, EL, FR, HR, HU, IE, LV, NL, RO, SK
Glyphosate	AT, BE, BG, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IT, LT, LV, MT, NL, PL, PT, RO, SE, SI, SK
Halosulfuron-methyl	BG, EL, ES, FR, HU, IT, PT
MCPA	AT, BE, BG, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SI, SK
Mecoprop-P	AT, BE, BG, CY, CZ, DE, EE, EL, ES, FI, FR, HR, HU, IE, IT, LT, LU, LV, NL, PL, PT, SI
Pendimethalin	AT, BE, BG, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SI, SK
Rimsulfuron	AT, BE, BG, CY, CZ, DE, EE, EL, ES, FI, FR, HR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SI, SK
S-Metolachlor	AT, BE, BG, CY, CZ, DE, EL, ES, FR, HR, HU, IE, IT, LU, MT, NL, PL, PT, RO, SI, SK
Triclopyr	AT, BE, CY, CZ, DE, EL, ES, FR, IE, IT, LU, NL, PL, PT, RO, SK
Nonanoic acid	AT, BE, BG, CY, CZ, DE, DK, EE, EL, ES, FI, HR, HU, IE, IT, LT, LU, MT, NL, PL, PT, RO, SE

Table E.5 Continued. Pesticide Registration Status in the EU. The European Union is often looked to for validation of chemical actions because of implementation of the REACH legislation which incorporates aspects of the "precautionary principle". Herbicides with registered uses on school grounds in Maine are compared to EU overarching authorization and member state authorizations. Country codes in table that follows.

Chemical Name	Member State Authorizations
Not Approved in EU	
Diquat dibromide	
Dithiopyr	
Glufosinate	
Pyrimisulfan	
Quinclorac	
Sulfentrazone	
Topramezone	
Pending	
Indaziflam	
Uncertain of EU synonym	
Fluroxypyr-meptyl	
Prodiamine	

Note: Country codes for the European Countries included in Table E.5.

Country Code	Country	Country Code	Country
AT	Austria	IE	Ireland
BE	Belgium	IT	Italy
BG	Bulgaria	LT	Lithuania
CY	Cyprus	LU	Luxembourg

CZ	Czech Republic	LV	Latvia
DE	Germany	MT	Malta
DK	Denmark	NL	Netherlands
EE	Estonia	PL	Poland
EL	Greece	PT	Portugal
ES	Spain	RO	Romania
FI	Finland	SE	Sweden
FR	France	SI	Slovenia
HR	Croatia	SK	Slovakia
HU	Hungary		

Addendum F– Focused exposure assessment for 2,4-D

Why focus on children's exposure?

It is widely known that children's bodies interact differently with the environment and adult bodies. Children have a larger surface area to volume ratio, they have a faster breathing rate, and they do not have all of the detoxification systems that adults have. This means that when an adult teacher and a student (child) walk out onto the school yard they will be exposed to different levels of applied herbicides despite remaining together the entire time. Additionally, we know that children act differently than adults do, frequently in ways that increase their potential exposure to applied herbicides. Children are known to play in dirt, sand, & grass, fall on playing fields, purposefully ingest found objects, and they can be less vigilant about washing hands prior to hand-to-mouth behaviors and eating.

EPA's hazard assessments for human health risk assessments include a number of tests. Ecological risk assessments are not discussed in this document, but they are also part of the pesticide registration process and would require a completely different additional set of animal test data. As an example of the studies used during human health risk assessments, Figure 3 contains a list of tests included in the most recent 2,4-D risk assessment.

Figure 3 shows the name and method ID number for each required test (leftmost column). These method ID numbers can be searched on the internet to obtain the specific details and requirements of the test. The two columns with 'yes' and 'no' statements tell the reader which tests have been requested and which tests have been satisfactorily submitted to the EPA as part of the risk assessment. In these tests there are specific guidelines indicating whether or not a test will be deemed acceptable. In certain tests the doses must be set appropriately, and a specific number of organisms affected, if none of them are affected or if they all are affected the test may not be appropriate for obtaining the specific endpoint data of interest. There are no acceptable animal assay test results in which all the test organisms escape uninjured. The goal of these studies is to explore what types of effects can be found and at what concentration do those effects appear. How hazardous a chemical would be defined by how small of an exposure is needed to produce effects. Not all pesticides will have all of the same tests performed, many times it is the discretion of the agency to waive certain tests if preliminary data suggest they would not be informative to the registration decision.

Study	Technical	
	Required	Satisfied
870.1100 Acute Oral Toxicity	yes	yes
870.1200 Acute Dermal Toxicity	yes	yes
870.1300 Acute Inhalation Toxicity	yes	yes
870.2400 Primary Eye Irritation	yes	yes
870.2500 Primary Dermal Irritation	yes	yes
870.2600 Dermal Sensitization	yes	yes
870.3100 Oral Subchronic (rodent)	yes	yes
870.3150 Oral Subchronic (nonrodent)	yes	yes
870.3200 21-Day Dermal	yes	yes
870.3250 90-Day Dermal	no	no
870.3465 90-Day Inhalation	yes	yes
870.3700a Developmental Toxicity (rodent)	yes	yes
870.3700b Developmental Toxicity (nonrodent)	yes	yes
870.3800 Reproduction	yes	yes
870.4100a Chronic Toxicity (rodent)	yes	yes
870.4100b Chronic Toxicity (nonrodent)	yes	yes
870.4200a Oncogenicity (rat)	yes	yes
870.4200b Oncogenicity (mouse)	yes	yes
870.4300 Chronic/Oncogenicity	yes	yes
870.5100 Mutagenicity—Gene Mutation – bacterial	yes	yes
870.5375 Mutagenicity—Structural Chromosomal Aberrations	yes	yes
870.5550 Mutagenicity—Other Genotoxic Effects	yes	yes
870.6100a Acute Delayed Neurotoxicity (hen)	no	-
870.6100b 90-Day Neurotoxicity (hen)	no	-
870.6200a Acute Neurotoxicity Screening Battery (rat)	yes	yes
870.6200b 90-Day Neurotoxicity Screening Battery (rat)	yes	yes
870.6300 Developmental Neurotoxicity	yes	yes
870.7485 General Metabolism	yes	yes
870.7600 Dermal Penetration	no	yes
870.7800 Immunotoxicity	yes	yes
Special Studies Comparative thyroid	yes	yes

Figure 3. Excerpt from a human health risk assessment registration document for 2,4-D showing the types and status of required toxicology data required by companies during registration.

The largest source of pesticide exposure in people is typically via ingestion of treated food and contaminated water. 2,4-D's dietary exposure assessment was extracted from the most recent human health risk assessment from the EPA registration document. Then additional school-specific exposures were determined using standard exposure assumptions to generate an extra protective buffer for use in a focused school—herbicide risk assessment. The calculated risk to children from the herbicide can then be compared to the values known to cause effects in test organisms and test systems.

With a focus on 2,4-D, we found that the current maximum application rate allowed for use on turf does not present undue risk to children, even after adding the exposures accrued at school. Risk is calculated by a combination of hazard and exposure. Pesticides have considerable hazard based on their nature. When evaluating appropriate uses of pesticides, management of exposure frequently takes priority in driving the allowable uses. 2,4-D is a pesticide that is widely used in many types of applications including agriculture, right-of-way areas, turf, and residential landscapes. EPA is required to calculate the pesticide exposure coming from all potential exposures and to ensure that these exposures do not adversely affect children.

Food & Drink

EPA used several sources of data to estimate the amount of a pesticide the population is exposed to. The data on the average diet of Americans is collected by USDA. USDA and FDA also collect analytical test data on pesticides found on food and drinking water. When a pesticide is allowed for use on food items, EPA sets a maximum limit to the concentration that may remain on the food item at the point of sale, these limits are known as tolerances in the US. EPA calculates the amount of pesticide residue allowed in food and drinking water by tallying the maximum tolerances for those items that are part of the average diet. EPA compares the calculated dietary maximum exposure to the analytical data generated by USDA to double check that the estimated daily exposure that was calculated truly is the maximum potential exposure. If analytic test data are higher than calculated data those higher numbers are used. Dietary values estimating daily exposure to 2,4-D across several ages are described in Table 4.

Table 4. Background Exposure to 2,4-D (acid form) from Food and Drinking Water.

2,4-D Daily Food & Drink		Exposure
	Age in years	**mg/kg-d**
	6 to 12	0.019
	13 to 19	0.012
	Adult	0.010

Vapors Inhaled While Breathing

For many people, inhalation is the most worrisome exposure route because of the perception that pesticides are constantly being inhaled after they have been applied. Children are known to have higher breathing rates and faster heart rates than adults which has the potential to lead to higher exposures. The potential for a chemical to be inhaled is largely controlled by the chemical's vapor pressure. Volatilization occurs when a liquid chemical convers into a vapor, which escapes into the atmosphere. High vapor pressure is tied to a high rate of volatilization on a surface and into the air. Most current-use pesticides have low vapor pressures, but it is important to evaluate each pesticide individually. Risk assessments sometimes avoid calculating the exposure that comes from inhalation during outdoor activities in residential settings. The low vapor pressure and immediate dilution in the outdoor air often do not lead to significant exposures.

For this review standard inhalation rates were used for children and adults. The rate of absorption across the lung and into the body was assumed to be 100%, the actual rate is unknown and this value keeps the assessment conservative. The vapor pressure of 2,4-D has several values in published chemical databases. The values for 2,4-D span several orders of magnitude from 8.3×10^{-5} to 9.9×10^{-8} mmHg. The value from MacBean (accessed from the PubChem database available at: https://pubchem.ncbi.nlm.nih.gov/compound/1486#section=Vapor-Pressure) was selected as a middle value (1.4×10^{-7} mmHg) and because it was referenced in EPA's risk assessment. This fit the moderately volatile category leading to a default air concentration of 15 $\mu g/m^3$ for use in the calculations. There is an assumption in the exposure estimate presented in Table 5 that students are not exposed to drift and that the product has dried prior to student's being allowed onto campus. The exposure period covers 24 hours beginning when the product has dried.

EPA reported environmental exposure data collected from the Pesticide Action Network North American (PANNA) in Minnesota. These data are not representative of school yard exposures, but they are helpful in understanding whether or not default air concentration values are relevant. The sample area in Minnesota was described as agricultural and the samples were collected in backyards by volunteers. From 340 samples collected over 19 locations, 2,4-D was detected in 3 sites. The air concentrations varied from 7 to 17 ng/m^3 and the maximum concentration collected was 115 ng/m^3. The default value used in these calculations (15 $\mu g/m^3$) converts to 15,000 ng/m^3 indicating considerable conservatism with the default concentration.

Table 5. Exposure to 2,4-D (acid form) from breathing air following an application.

Vapor Inhaled (assumes 24 hr day)		Exposure
	Age classification	**mg/kg-d**
	Child	0.016
	Adult	0.003

Accidental Soil Ingestion

Accidental soil ingestion describes the infrequent ingestion of soil and was included in this analysis because pre-Kindergarten programs are becoming more popular in Maine schools. Soil ingestion activities are associated with babies and toddlers and some of the assumed values used in this calculation come from soil ingestion rates for one- to two- year olds. These calculations rely on the volume ingested, the concentration applied, the extraction potential of saliva, and the rate of dissipation from the soil. The potential exposure generated from 2,4-D application on school grounds is presented in Table 6.

Table 6. Exposure to 2,4-D (acid form) from soil ingested accidentally ingested during play.

Soil Accidentally Ingested		Exposure
	Age by year	**mg/kg-d**
	6 to 11	1.1×10^{-08}
	11 to 16	9.0×10^{-06}
	Adult	6.1×10^{-06}

Soil Ingested From Hand to Mouth Activities
Pesticide residues can make it into children's bodies from normal frequent habits, like wiping one's mouth, with dirty hands. Hand to mouth activities include thumb sucking, nail biting, and gesturing. Hand washing and hygiene becomes better controlled as children grow and transfer of resides from hand to mouth decrease over time. The size of hands, frequency of hand to mouth movements, application rate, number of times hands touch the ground, extraction potential of saliva, ground to hand transfer of particles, and length of time outside all contribute to the estimated exposure presented in Table 7.

Table 7. Exposure to 2,4-D (acid form) from hand to mouth activities while outside during play.

Ingestion from Hand to Mouth Activities		Exposure
	Age by year	**mg/kg-d**
	6 to 11	2.5×10^{-05}
	11 to 16	1.4×10^{-05}
	Adult	9.1×10^{-06}

Across The Skin Transfer of Residues From Contact With Treated Outdoor Surfaces
The skin is a barrier to many things but some chemicals are able to transfer across and enter the body. As part of the registration process dermal penetration studies are often required to assess

the rate of transfer. Dermal penetration is very significant in assessing applicator exposures, but it also has a role in residential exposures for times when people are in contact with the ground. This calculation also uses the turf transferable residues (TTR) value, which is also frequently required for pesticide registration. TTR measures the amount of residues that transfer from the turf onto the person, this varies because of differences in chemical structures between pesticides that dictate chemical movement following application. Additionally, information on how much of the pesticide will adhere to exposed skin, application rate, dissipation rate, body surface area, and hours spent outside are included in these calculations. An assumption is made that people are wearing shorts and short-sleeved shirts during the time spent outdoors. This exposure route was the most significant contributor to the total 2,4-D exposure in this analysis, likely because of the large contact area of the skin, these results are presented in Table 8.

Table 8. Exposure to 2,4-D (acid form) from transfer of residues from treated grounds into the body.

Across the Skin Exposures		Exposure
	Age by year	**mg/kg-d**
	6-11	0.071
	11-16	0.057
	Adult	0.047

Exposure Totals

When summed together the exposure students receive at school did not indicate that at any point were students at risk to undue harm from exposure to 2,4-D. These values used in calculating time spent at school exposures were all meant to be highly protective and overexaggerate the potential exposures in order to be protective. Table 9 displays the summed exposure values and compares them to EPA's identified no observed adverse effect level (NOAEL).

The NOAEL is the highest dose tested that did not show any adverse effects in test organisms. The NOAEL for 2,4-D is 21 mg/kg-d and is based on a rat study where rats' kidneys were enlarged with changes in morphology by the end of the chronic feeding study. While this observed NOAEL represents a threshold value not to exceed, it carries uncertainty in interpretation (people are not rats, not all people are the same, etc). Due to this uncertainty the NOAEL is further divided by 100 in order to develop the daily threshold dose of 0.21 mg/kg-d, also known as the population adjusted dose or PAD. In human health risk assessments, it is common to compare the estimated exposure to the NOAEL and ensure that exposure does not reach the level of the NOAEL. The distance between ratio of the two values is assessed as the margin of exposure (MOE) and the MOE must be greater than the level of concern (LOC). The LOC is the threshold for whether or not the exposure is sufficiently lower than the NOAEL, a LOC = 100 it represents a difference of 100 times between the estimated exposure and the threshold value.

Table 9. Summary exposure data for 2,4-D (acid form) for all examined inputs; dietary, dermal, ingestion, and inhalation.

Age in years	Exposure Totals[a] mg/kg-d	NOAEL[b] mg/kg-d	Margin of Exposure (MOE)[c]	Level of Concern (LOC)[d]
6 to 11	0.107		197	
11 to 16	0.073	21	289	100
Adult	0.057		368	

[a]Values summed from combining data taken from Tables G, H, I, J, & K.
[b] No Observed Adverse Effects Level (NOAEL): highest tested concentration with no effects.
[c] MOE= NOAEL / Exposure total
[d] MOE values greater than the LOC indicate no concerns for health.

In the human health risk assessment that was part of the registration process for 2,4-D, EPA elected not to include any of the dermal exposures calculated here due to the lack of toxicity observe from the dermal route. The dermal toxicity studies performed, indicated no potential for adverse effects because no effects were found from a chronic exposure study on rabbits at the limit dose. The limit dose is the largest feasible dose to administer and is a dose so large that it is impossible to reach that quantity under anticipated circumstances. Specifically, for this assessment, rabbits chronically exposed to 2 grams of 2,4-D daily via dermal exposures (typically bandages hold the substance next to shaved skin) showed no adverse effects from the treatment.

Dermal exposures were the largest driver of exposure in this assessment. Some of the assumptions made in this assessment create a highly conservative assessment. For example, children are required to be in school 180 days each year. The ground in Maine is typically covered in snow or frozen from December to April, or approximately half the school year. Cold temperatures in fall, winter, and spring all mean that children wear long-sleeves and pants when they go outside so the assumption about shorts and t-shirts. Keeping the conservative nature of these values makes sense in light of the typical timing of herbicide applications which corresponds to short and t-shirt weather.

2,4-D exposure data were selected as an example of the type of more in depth review that can be made for each of the herbicides currently allowed for use on school grounds. This type of review would be further improved upon by searching the peer-reviewed literature for updated chemical-specific information assessing the appropriateness of the hazard value (NOAEL).

This assessment used 2,4-D in its acid form. In practice, several other forms of 2,4-D are available, there are several salt types and several ester types. These different versions will create different properties that describe how the chemical moves through the environment. In some aspects the above exposure assessment will over estimate exposure while in others it will under estimate exposure. Ester and amine forms are expected to degrade rapidly into the acid form following application, though the rate will depend on pH, temperature, and other environmental factors. Because the toxicity to salts and esters are similar to the acid forms the acid form has been used to represent the group. The following listing details each of the currently registered forms of 2,4-D.

Table 10. Chemical forms of 2,4-D currently registered by US EPA. The most recent human health risk assessment categorized these forms of 2,4-D as substantially similar for the purposes of the risk assessment.

Name	Chemical Identifiers	
	CAS#	PC Code
2,4-Dichlorophenoxyacetic acid (2,4-D)	94-75-7	030001
2,4-D dimethylamine salt (DMA)	2008-39-1	030019
2,4-D sodium salt (Na)	2702-72-9	030004
2,4-D diethanolamine salt (DEA)	5742-19-8	030016
2,4-D, isopropylamine salt (IPA)	5742-17-6	030025
2,4-D, triisopropanolamine salt (TIPA)	32341-80-3	030035
2,4-D, butoxyethyl ester or 2,4-D, butoxyethanol ester (BEE)	1929-73-3	030053
2,4-D, 2-ethylhexyl ester (2-EHE)	1928-43-4	030063
2,4-D, isopropyl ester (IPE)	94-11-1	030066
2,4-D choline	1048373-72-3	051505

Addendum G. MAC Meeting Minutes

MAC ADVISORY COMMITTEE

September 20, 2021
1:30 PM Committee Meeting
MINUTES

Present: Hicks, Neavyn, Poland, Waterman

BPC Staff: Boyd, Bryer, Couture, Patterson
Department Staff: Fish, Peterson

- Patterson explained to the Medical Advisory Committee (MAC) that this year the state legislature passed LD 519, which prohibited the use of glyphosate and dicamba within 75' of school grounds, with some exemptions, and directed the BPC to convene its MAC to evaluate the use of all other current uses of herbicides on school grounds and the potential human health impact. A report back to the legislature with their findings is required.
- Waterman stated that looking at integrated pest management (IPM) and then the significance of the pests that schools were trying to control he had a hard time believing controlling weeds on school grounds rose to the level of using chemicals. He added that glyphosate's manufacturer stated there were no adverse health effects to their product, however they spent 10 billion to payout in settlements for people with cancer. Waterman stated that the European Union (EU) had banned glyphosate, Germany was phasing it out, and California has listed it as restricted. Waterman noted several articles from scientific journals, including one from the American Academy of Pediatrics and Environmental Health that included research on glyphosate. He also commented about calculating risks of different levels of contamination in children and said he doubted there would be any safe lower dosage unit for potential carcinogens to be used on school grounds. Waterman concluded that there were serious reasons to worry about herbicide exposure in children.
- Patterson shared the language from the bill, so all members were clear about what the exact ask was from the legislature. She noted that glyphosate was still approved for use in the EU through 2022 and the active ingredient is currently under review.
- Hicks explained the differences between how the EU and the EPA considered risk. She stated that the EU had to consider exposure, while the EPA evaluated risk and exposure and combined the two. Hicks stated that the question to consider was if an individual was exposed to a level that would cause harm. She suggested they create a spreadsheet of herbicides and decide what the MAC would like to look at if they were doing a risk

assessment. Hicks stated that the committee needed to consider that because if they did not then they would not have a leg to stand on if they were to be challenged in court.

- Poland commented that schools already do have an IPM Coordinator and rules in place on what they can and cannot use.
- Patterson gave the MAC an overview of the pertinent rules in Chapter 27 regarding making pesticide applications on school grounds.
- Neavyn stated that along with environmental health the MAC should also consider the potential for children getting into these chemicals on campus. He added that schools were doing a lot more outdoor classes in the fall and spring, so students were outside more, and also that increased flow of air into the building should also be considered.
- Patterson stated that anyone making applications in or around schools must be licensed as commercial pesticide applicators and most schools contract out for this service so there normally would not be pesticides stored on school grounds.
- Waterman stated that they needed to find out what pests the schools were trying to control.
- Fish replied that from his 38 years of experience schools were using herbicides primarily on athletic fields but also fence lines, to control poison ivy, and minimally on lawn areas. Fish stated that according to rule the school is required to give a notice five days in advance if any applications are made during the school year and they also must follow restricted entry intervals on the label, which would be different for each herbicide. He added that the IPM coordinator must go through a multistep process to document the problem, identify the pest, and must consider use of all non-chemical methods before utilizing pesticides.
- Waterman suggested that the control of aesthetic weeds, like dandelions and crabgrass could be controlled manually, and that poison ivy could also be controlled mechanically. He said he did not feel these rose to the level of requiring the use of herbicides. He mentioned considering the history of some of the chemicals that were once commonly used that are now scorned because the late side effects of them were discovered.
- Fish stated that athletic fields need to be grass for more than just aesthetic reasons and having weeds compacts the soil, is not conducive to athletic moves, and causes more injuries when falling. He added that a big problem on school athletic fields also had to do with overuse and the Department had worked with the schools for several years about overseeding their fields to help prevent weeds. Fish said that mowing poison ivy may give a person one huge exposure to urushiol that they end up breathing in and may require a hospital visit. He stated that there were instances where herbicides were the safest tool to use and as for glyphosate it had been around a long time and was the most studied chemical in the world.
- Waterman mentioned the possibility of concerns for long term effects, like there were from DDT, and there was a lot of push back from scientists and lack of people willing to testify back then.

- Fish said that when DDT was in use there was no EPA and there was no risk assessments and EPA was the reason DDT went away, except where it is still used for malaria. He added that back then there was not an authority on regulating DDT and other pesticides and now there are protocols in place to find potential long-term effects.
- Neavyn stated that from his perspective at the Northern New England Poison Center people called into the poison center regarding all sorts of exposures. He stated that in evaluating the risk of pesticide application on school grounds, it was not simply a question of whether a substance was toxic, they must also assess whether there was a risk of clinically significant exposure. Neavyn said that in his experience at the poison center when people hear something is toxic there are automatic assumptions made regarding the significance of an exposure. He said the MAC needed to think about risk messaging, including what constituted a significant risk exposure and what did not. He added that it seemed the risk of exposure was low regarding these types of herbicide applications.
- Patterson stated that BPC staff could collect data on what was the current use pattern on school grounds.
- Waterman replied that would be helpful to include in the report back to the legislature.
- Patterson stated Bryer had prepared a letter to send to commercial for hire companies who make pesticide applications on school grounds to request the records of what was applied on school grounds in 2020 and 2021.
- Waterman stated that sounded good and if all members were in favor of that proposal the MAC could confer on that data once it was collected.
- Patterson noted that along with the rules in Chapter 27 there were also best management practices that were developed in 2012 by the BPC.
- Fish commented that companies that do a lot of the application work had made a big change in the way they approach how they manage school grounds. Fish, and recently retired IPM Specialist, Kathy Murray, spent 25 years conducting trainings and also have a cooperative with Massachusetts and Cornell all with the thought being that we have to minimize reliance of pesticides. Fish stated that many of these companies have moved toward utilizing much better tactics like overseeding, and keeping the best management practices in mind, such as considering toxicity, and not using pesticides at all for aesthetic purposes on areas with low frequencies of use.
- Waterman stated that it sounded like the next step would be to review the materials and then reconvene the MAC. He asked when the request for the reports could be send out.
- There was discussion about a good timeline to have the use reports due and it was decided that two weeks gave applicators adequate time to gather this information.
- Hicks stated that the spreadsheet that she sent out had information on it about the herbicides able to be used on school grounds and included data such as: no-observed-adverse-effect-level (NOAEL), Food Quality Protection Act (FQPA) safety factor, type of effect, etc. The result of these numbers can be found by looking through EPA's most recent risk assessments. Hicks would like to combine that with the use data and look at

the active ingredients being used and evaluate them for potential risk. She added that EPA had levels of concern they could use, or the MAC could develop their own. Hicks said that this would allow the committee to actively rank active ingredients by risk, so they know they are not banning one thing and forcing someone to use a more toxic product.

- Patterson said that the report back to the legislature should explain findings, propose recommendations, and suggest regulations.
- Waterman motioned to adjourn the meeting and the MAC will wait to receive the pesticide use data referred to above.

Meeting adjourned at 2:33 PM

MAC ADVISORY COMMITTEE

November 18, 2021
2:00 PM Committee Meeting
MINUTES

Present: Hicks, Neavyn, Poland, Waterman

BPC Staff: Boyd, Bryer, Couture, Patterson, Tomlinson
Department Staff: Fish, Peterson, Gibbs

- Waterman began the meeting and gave opening remarks. He stated that the group had looked at the information submitted by commercial applicators detailing what had been applied on school grounds in the last two years. Waterman stated that 458 school units applied herbicides over the two reporting years, 2020 and 2021, and that it looked like glyphosate and dicamba were some of the main active ingredients used. He stated that the legislature wanted to know if prohibition of herbicides should be expanded on school grounds. Waterman stated he did a medical journal web search in the pediatric population to find articles on the topic. He stated there was one titled "Council on Environmental Health. Policy Statement: Pesticide Exposure in Children," from Pediatrics, December 2012, which stated "Epidemiologic evidence demonstrates associations between early life exposure to pesticides and pediatric cancers, decreased cognitive function, and behavioral problems." and that "Chronic toxicity endpoints identified in epidemiologic studies include adverse birth outcomes, including preterm birth, low birth weight and congenital anomalies, pediatric cancers, neurobehavioral and cognitive deficits, and asthma." Waterman cited a 2019 article from Mutation Research titled, "Exposure to glyphosate-based herbicides and risk for non-Hodgkin's lymphoma. A meta-analysis and supporting evidence," that he said cited a 42% increased risk for non-Hodgkin's Lymphoma with chronic glyphosate exposure. Waterman also noted the EPA's 2014 report on 'Child-

Specific Exposure Scenarios Examples' that discussed ingestion of contaminated soil and dust, inhalation of contaminated air while playing in a schoolyard, and dermal contact with contaminated soil among teen athletes.

- There was discussion about active ingredients that had been used that may not have been registered for use on school grounds.
- Waterman stated that there was proof that use of these herbicides was detrimental to children and he recommended they limit the use of them on school grounds.
- Hicks commented that a lot of the info Waterman was looking at depended on the active ingredients. She said that EPA had given exposure parameters for children and it also mattered whether a product was applied as a liquid or a solid. Hicks stated she had identified about 187 peer-reviewed articles and either the summary or abstract have been reviewed. She said she intended to take a pass at reviewing the articles and also asking if Bryer would take a second look to see if the articles were relevant or not. Hicks noted that studies looking at exposure levels would be relevant and suggested the group put together a preliminary report stating what was involved and where the MAC was at after reviewing the data.
- Hicks stated that this was a large project given the fact there were twenty-four active ingredients, and each had EPA documents talking about the risks involved and a set of public literature that needed to be reviewed before coming to an informed conclusion. She added that if the committee did not want to go so far then they could just look at the most recent EPA risk assessment documents and pull the data together for a risk assessment.
- Poland asked if the report should include what practices and rules schools were supposed to employ when applying those products that could prevent exposure.
- Hicks responded that that information should definitely be included.
- Poland inquired whether or not there was evidence that the rules were inadequate, and kids were being exposed unnecessarily.
- Patterson said that Bryer had gone through some of the past data and created some graphics for easy viewability.
- Bryer stated that this was done to see if the patterns of use fit the law. She stated that the information Hicks pulled out about active ingredients that were not for school use had been sent to BPC enforcement staff.
- Tomlinson provided corrections to the list of active ingredients provided by Hicks regarding products that were and were not approved for use on school grounds. Tomlinson highlighted questionable data from applicators.
- Patterson stated that staff have information on who the applicators were so if they were using products not labeled for the site then that was a violation of the law and enforcement staff could follow up with them. She added that it would also be good to have a conversation with the schools' IPM coordinators and inform them about the importance of signing off on the products being used.

- Bryer stated that what they had received was messy data and they had not had much time to spend with it but have extrapolated some information. She displayed a graph demonstrating what number of applications were made by month.
- Patterson discussed the rules around notification for pesticide applications at schools and when applications could be made.
- Poland stated that athletic fields were also frequently used throughout the summer for camps and recreation programs.
- Kathy Murray, retired IPM Specialist, Department of Agriculture, Conservation and Forestry, explained that the Chapter 27 rules were developed in a complicated way to provide maximum flexibility to schools to control weeds to prevent bad slips and falls on sports fields. She added that the MAC may possibly want to provide an extra limitation window stating that herbicides may only be applied if schools are closed for at least one week.
- Poland responded that that seemed reasonable.
- Waterman stated that it would seem reasonable if you were sure there were not long-term risks like pediatric cancer which takes precedent over controlling dandelions.
- Poland asked Waterman about the studies he cited and how they were defining exposure.
- Waterman replied that they were mostly in agricultural settings.
- Fish responded that that type of application was totally different than how applications were made in Maine and it was like looking at apples and eggs.
- Hicks stated that these uses were not the same and this was part of what needed to be looked at during the risk assessment portion of the project and the committee was not there yet.
- Patterson discussed how difficult it was going to be to enforce 75 feet after school grounds end.
- Bryer presented data on how many acres were sprayed with each active ingredient or tank mix.
- Waterman stated that he hoped this would be the last meeting of the MAC before the report was provided to the legislature. He said he does not have enthusiasm for delaying the report any longer. Waterman stated that the report was due in February and that the time remaining needed to be spent writing up the report, bearing in mind they were not writing legislation, just what the MAC found. He suggested the possibility of separate reports from MAC members if a consensus was not reached.
- Hicks said that there was actually another step in there; the MAC makes the recommendation to the Board of Pesticides Control and the Board makes the recommendation to the Agriculture, Conservation & Forestry Committee.
- Patterson agreed that there was not a consensus at this time, but the report needed to go before the Board and there would be a meeting in January where this would be appropriate to do.

- Neavyn commented that everything was a potential hazard so maybe the MAC should be focusing on the risk of exposure and whether there was a true exposure risk. He noted the difference between spot and broadcast treatments and said he did not feel that glyphosate imposed that significant of a risk.
- Hicks stated that when EPA looked at exposure to pesticides one of the things they looked at was formulation and that was part of what would come into play with the actual risk assessment. She suggested possibly just using EPA's most recent toxicological levels and frequency of use in the state of Maine to determine if this was an issue.
- Waterman stated that on pages 24-27 of the U.S. EPA's 'Child-Specific Exposure Scenarios Examples, Final Report' it discussed ingestion of contaminated soil and stated that there was no low amount that was safe, so obviously that was not a settled issue. Waterman noted he was concerned to see in the applicator records that Roundup was applied all over the fields of his high school alma mater.
- Hicks commented that if glyphosate was all over the field there would not be a field there.
- Waterman stated that he had wanted to poll MAC members about how to proceed but instead was going to wait until the full meeting of the Board the following day. He asked if MAC members had anything to add to that plan.
- Hicks stated she would like to sit in on the Board of Pesticides Control meeting virtually and convey to them that the MAC was not done yet and still had a ways to go. She added that the MAC could look at EPA toxicology data and not look at the actual individual chemical reviews.
- Poland stated that she had nothing to add at this point but would like to come to a consensus from the MAC on the recommendation to the legislature.
- Neavyn suggested that the MAC provide interim guidance with a general approach on how they are assessing this risk to children and then after that maybe provide more specific guidance looking at the specific chemicals.
- Patterson asked Waterman if there was a desire to have meeting before the end of the year.
- Waterman replied that he would be in touch after the Board of Pesticides Control meeting.
- The meeting was adjourned at 3:05 PM.