

Island Ecology & Pesticide Use

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Why would you listen to me?

- I am a grandfather of 1 with 1 on the way, and a father of 2.
- I am a 10th-generation Mainer who loves this state enormously.
- I have been teaching farmers, master gardeners, master naturalists, garden clubs, etc. for 38 years.
- I live on a lake and do everything I can to protect it.
- I am a nature photographer who spends most of my time outdoors hiking, kayaking, and gardening.



I decided to create my presentation directly from your questions.



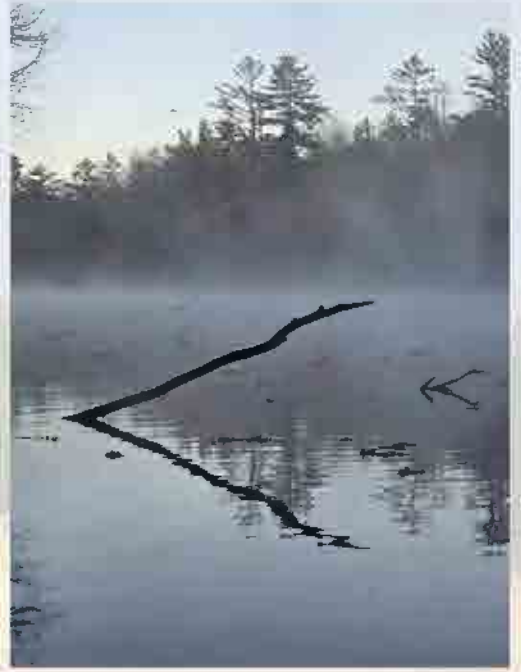
What makes a place (including an island) more susceptible to pesticide effects?

- It depends:
  - Off–target effects of pesticides depend on what product is used and how and where it is applied.
  - Does the product move through the soil?
  - What are the soil conditions?
  - What are the wind conditions at the time of application?
  - Precipitation before, during or after?
  - Sensitive areas nearby?
  - The Windows Pesticide Screening Tool can help.



Which types of applications are riskier?

- Application-type risk depends on multiple factors:
  - Spray or granular;
  - Backpack mist blowers, high risk of drift;
  - Injected into a plant or the soil;
  - Wide area or spot treatment;
  - Concentrated or diluted;
  - Tightly adsorbed, absorbed, or mobile;
  - Restricted entry interval required by label;
  - Following the label directions or not.



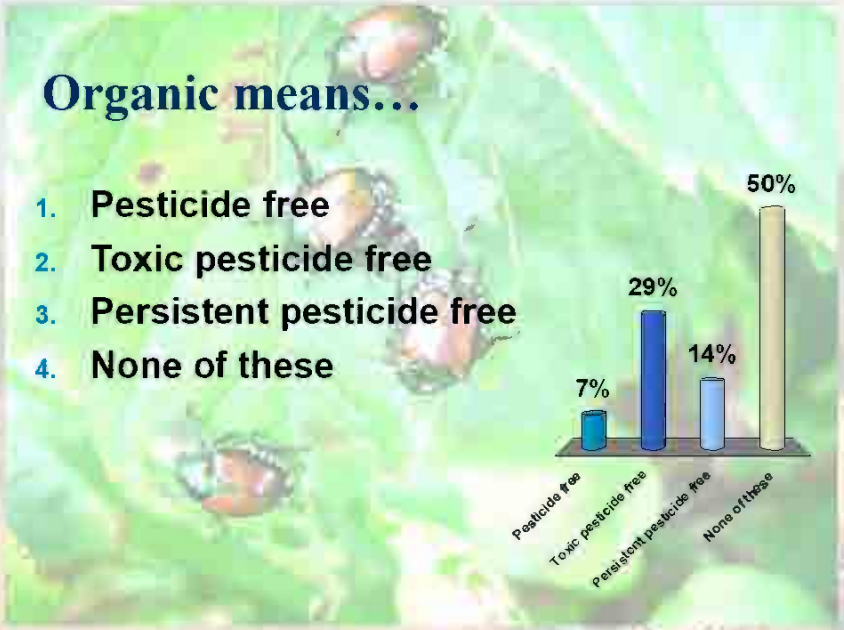
Pesticides of greatest concern

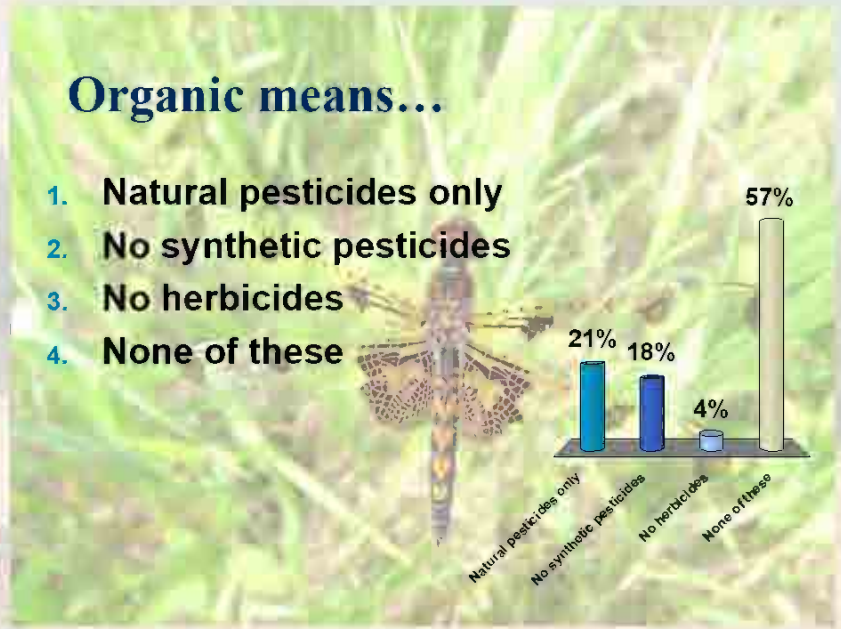
- Unnecessary applications are the worst.
- Applications contrary to the label are equally bad.
- Natural is not automatically safer.
- Synthetic is not automatically riskier.
- Efficacy is very important.
- The need for multiple applications is worse.
- Potential for off-target exposure is important to consider.



What does organic mean

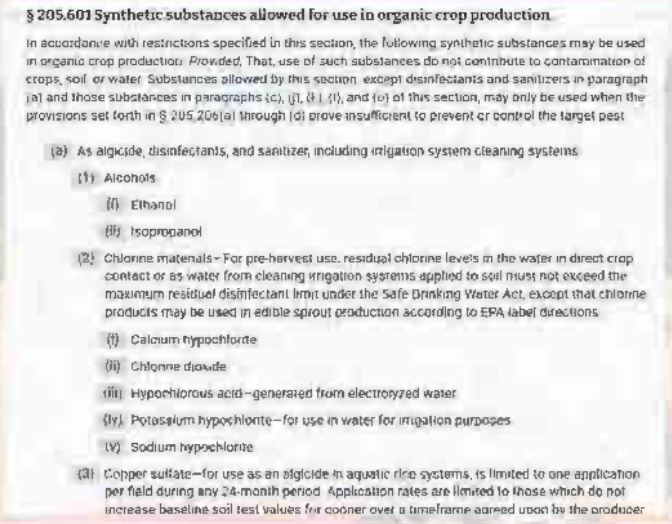
Poll answers a few years back.





What does organic mean

- USDA rule says: A labeling term that refers to an agricultural product produced in accordance with the Act and the regulations in this part.
- https://www.ams.usda.gov/about-ams/programs-offices/national-organic-program



§ 205.601 Synthetic substances allowed for use in organic crop production.

In accordance with restrictions specified in this section, the following synthetic substances may be used in organic crop production: *Provided*, That, use of such substances do not contribute to contamination of crops, soil, or water. Substances allowed by this section, except disinfectants and sanitizers in paragraph (a) and those substances in paragraphs (c), (j), (k), (l), and (o) of this section, may only be used when the provisions set forth in § 205.206(a) through (d) prove insufficient to prevent or control the target pest.

(a) As algicide, disinfectants, and sanitizer, including irrigation system cleaning systems.

(1) Alcohols.

(i) Ethanol.

(ii) Isopropanol.

(2) Chlorine materials – For pre-harvest use, residual chlorine levels in the water in direct crop contact or as water from cleaning irrigation systems applied to soil must not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act, except that chlorine products may be used in edible sprout production according to EPA label directions.

(i) Calcium hypochlorite.

(ii) Chlorine dioxide.

(iii) Hypochlorous acid–generated from electrolyzed water.

(iv) Potassium hypochlorite–for use in water for irrigation purposes.

(v) Sodium hypochlorite.

(3) Copper sulfate–for use as an algicide in aquatic rice systems, is limited to one application per field during any 24-month period. Application rates are limited to those which do not increase baseline soil test values for copper over a timeframe agreed upon by the producer

Are there non-toxic methods

- Even water is toxic when you drink too much all at once.
- Everything is chemical and even “natural” pesticides are synthesized by plants or microbes and then processed into a formulation that can be applied.
- Integrated Pest Management should always be the approach, but
- Even mechanical methods cause unintended consequences.



Are towns managing pesticide risk well?

- https://www.maine.gov/dacf/php/pesticides/public/municipal_ordinances.shtml
- 35 municipal ordinances officially filed.
- Range from bans on herbicides to restrictions on chemical/synthetic pesticides on lawns and landscapes.
- Most are not enforced because towns don't have the resources to manage them.



Portland issues first fine for violation of pesticide use ordinance

Seabreeze Property Services was fined $500 for spraying an herbicide at a property managed by Avesta Housing on Stevens Avenue in August.

Municipal Ordinances

- Towns must notify the BPC before voting to adopt any pesticide ordinance
- 22 MRS Section 1471-U dictates the notification process
- Towns must enforce their ordinances on their own





Pesticide effects on vernal pools

- Most pesticide products are not allowed to be used on wetlands without a special permit from DEP and BPC.
- When standing water is present, little or no pesticides are allowed to be applied.
- Risk comes from improper application to saturated soils or just before heavy rains.
- Some insecticides, both natural and conventional, are highly toxic to fish and aquatic invertebrates.



Biodiversity and resilience

- Protecting biodiversity is key to ecosystem resilience on islands and everywhere else.
- Pesticides can be used to protect biodiversity or can be detrimental to it as well.
- Invasive species management is crucial to the protection of biodiversity.
- Targeted pesticide applications can be very low risk.
- Improper use of pesticides can be very harmful.



Barberry infestation at Wells Reserve.

Vulnerable ecosystems & habitats

- In the past, many pesticides were extremely persistent and posed huge risks to the top of the food web.
- Some modern pesticides can still cause non-target injury because they move through the food web.
- Aquatic habitats, wetlands, riparian areas, etc., are all vulnerable to natural and conventional pesticides.
- Soil organisms are also vulnerable to various IPM methods, not just pesticides.
- http://npic.orst.edu/HPT/



Natural pesticides used historically until the early 70s

- Arsenic
- Lead
- Copper
- Zinc
- Nicotine
- Rotenone



Historic pesticide use

Bug death was:

- Zinc oxide
- Sulphur
- Lead oxide
- Nicotine



Conventional pesticides used historically until the early 70s

- DDT
- Chlordane
- Dieldrin
- Aldrin
- Dinoseb
- 2,4,5-T





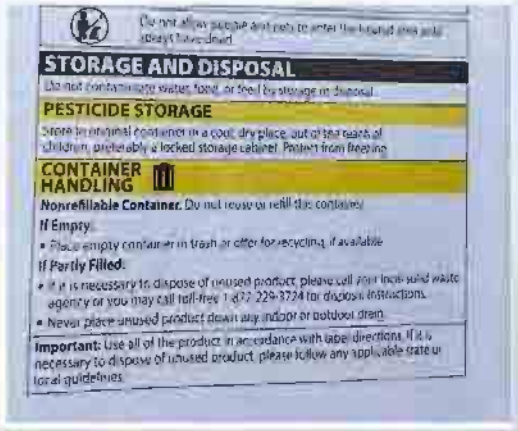
BPC has an obsolete pesticide collection





Pesticide shelf life

- Pesticide labels are not required to have expiration dates, some biologicals do like Bt.
- Some formulations, properly stored, will last many years.
- Many products have short half-lives and do not last.
- We always recommend writing the date on a newly purchased product.
- Once mixed, many products break down fast in water.


STORAGE AND DISPOSAL

PESTICIDE STORAGE

CONTAINER HANDLING

Nonrefillable Container. Do not reuse or refill this container.

If Empty:

- Place empty container in trash or offer for recycling, if available.

If Partly Filled:

- If it is necessary to dispose of unused product, please call your local solid waste agency or you may call toll-free 1-(877) 229-3724 for disposal instructions.
- Never place unused product down any indoor or outdoor drain.

Important: Use all of the product in accordance with label directions. If it is necessary to dispose of unused product, please follow any applicable state or local guidelines.

Notification signs & target organisms.

- Only certain applications require posting a notification sign
  - Outdoor - ornamental, turf, vegetation management, mosquito, tick and structural pest (not bait stations).
- Target organisms may include ticks, mosquitoes, grubs, weeds, etc.
- Products must be labeled for the site and registered by the BPC.
- Non-target effects depend on many factors.



Notification rules

- Notification before pesticide applications can be requested in multiple ways.
- If part of your property is a sensitive area, you can request to be notified about pesticide applications within 500 feet.
- Certain pesticide applications to K-12 schools require posting or notification to parents, guardians and staff.
- Posting is required for certain applications as mentioned earlier.
- You can automatically get notice about certain commercial applications by signing up for the notification registry.



01 → DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY

026 → BOARD OF PESTICIDES CONTROL

Chapter 28: → NOTIFICATION PROVISIONS FOR OUTDOOR PESTICIDE APPLICATIONS

SUMMARY: These regulations establish procedures and standards for informing interested members of the public about outdoor pesticide applications in their vicinity. This chapter sets forth the requirements for requesting notification about pesticide applications for posting property on which certain commercial pesticide applications have occurred and also establishes the *Maine Pesticide Notification Registry*, structure and fees.

Section 1. → Requesting Notification About Outdoor Pesticide Applications

→ The purpose of the following notification requirement is to enable individuals an opportunity to obtain information regarding outdoor pesticide application activities in their vicinity.

→ A. → Requests for Notification; How Made

→ The owner, lessee or other legal occupant of a sensitive area may make a request to be notified about any outdoor pesticide application(s) which may occur within 500 feet of that sensitive area and any aerial application(s) which may occur within 1,000 feet of the sensitive area.

Maine Pesticide Obsolete Inventory and Notification Registry Portal

Required fields are marked with an asterisk.

- Maine Pesticide Obsolete Inventory and Notification Registry Portal
- Pesticide Notification Registry
- Obsolete Pesticide Inventory
- Review

Submit

The Board of Pesticides Control (BPC) is Maine's lead agency for pesticide oversight.

The following application allows individuals to submit details to the agency in order to request to be included in Maine's pesticide notification registry or complete the online registration/inventory form for the annual obsolete pesticide collection process.

Which Board of Pesticides Control form which you like to complete? *

Pesticide Notification Registry

The purpose of this registry is to maintain a list of individuals who must be notified of outdoor, non-agricultural pesticide applications in their vicinity. This registry best serves urban and suburban residents who seek a more formal notification process for outdoor pesticide applications made on neighboring lawns, surrounding landscapes, and around structures.

For more infomation about the notification registry and the notificaiton process visit the BPC Website.

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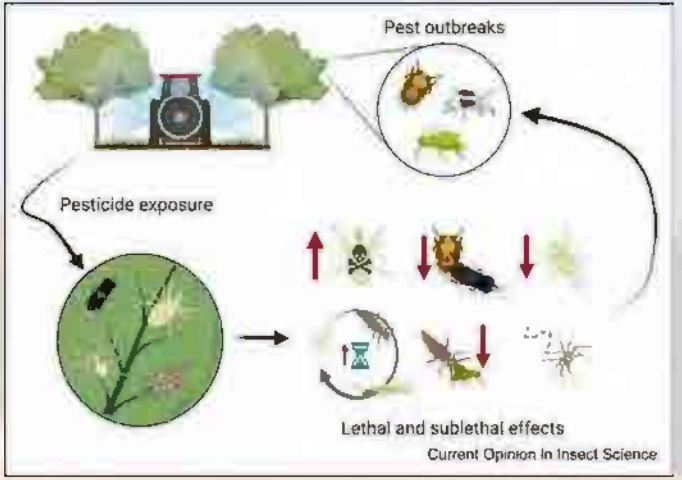
Will pesticide applications annihilate all living organisms in a yard?

- The days of highly toxic treatments that persist for many years are gone.
- Broadcast applications of insecticides are going to cause non-target damage over a short period of time.
- Fungicides and herbicides are less likely to affect non-target organisms.



https://www.sciencedirect.com/science/article/abs/pii/S2214574523000536

Will neighbor applications affect your yard?

- The worst situation is direct pesticide drift or runoff, which is unlawful.
- Killing weeds or other flowering plants might discourage some pollinators.
- Killing insects next door affects the food web, but the impacts depend on the area treated and what kind of habitats are nearby.
- Most labels do not allow applications to blooming plants or drift to blooming plants



Effects on aquifers and wells

- The majority of pesticides are not highly leachable.
- Some products have specific warnings on their labels that limit application parameters
- Soil particles and organic matter tie up many of them.
- Applicators should follow BMPs and avoid applications near wells https://www.maine.gov/dacf/php/pesticides/documents2/bmps/turf_bmps_Spring_2009.pdf
- Some pesticides are more likely to run off and those are the ones that may end up in surface waters or the ocean.



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 6½ 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 600,000 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.

Water quality sampling

- The BPC conducts periodic groundwater and surface water sampling for the presence of pesticides.
- Although pesticides have been detected at times, these detections are typically well below EPA-established benchmarks for risk to human health and aquatic life. https://www.maine.gov/dacf/php/pesticides/public/water_quality.shtml



Water Quality Studies

Reports on surface water findings, as well as ground water findings, can be viewed below or obtained by calling the BPC at 207-287-2731.

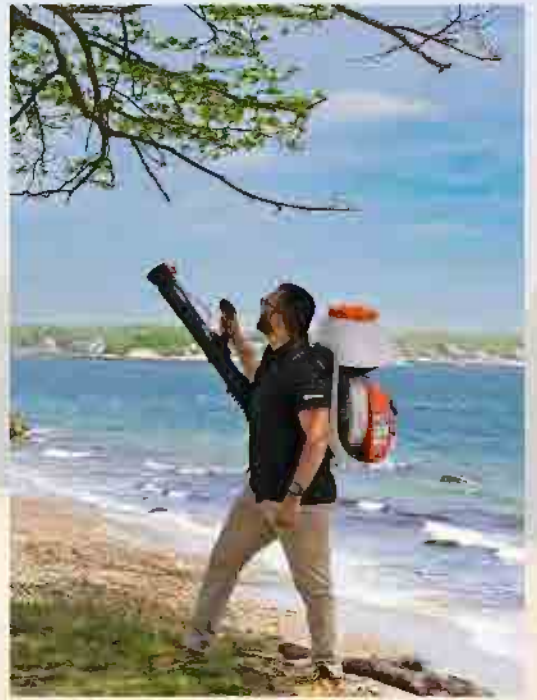
- 2023 Aerial Forestry Study (PDF)
  - 2023 Aerial Forestry Study Data (XLSX)
- 2021 Surveillance for Current-use Pesticides in Maine's Freshwater Resources Along a Population Gradient (PDF)
- 2015 Interim Report on the Environmental Risk Advisory Committee Study of Pesticides and Lobsters (PDF)
- 2007 Report on Monitoring of Pesticide Drift from Applications to Control Browntail Moth (PDF)
- 2006 Monitoring of Pesticide Drift from Applications to Control Browntail Moth (PDF)
- Pyrethroid Analysis Performed at the University of Maine Food and Chemical Safety Laboratory, Orono, Maine, January–April 2007 (PDF)
- 2006 Ground Water Monitoring of Hexazinone (PDF)
- 2005 Pesticides and Ground Water Monitoring Program (PDF)
- 2004 Drift Study of Aerially Applied Blueberry Pesticides (PDF)
- 2003 Drift Study of Two Aerially Applied Blueberry Pesticide (PDF)
- 2002 Pleasant River Time Series Study (PDF)
- 2002 Ground Water Monitoring of Hexazione (PDF)
- A Pilot Study: Railroad Right of Way Herbicides and Maine's Surface and Ground Water (PDF)



BPC staffer collects a water sample.

Do most companies use the same pesticides?

- Depending on the target pest, most commercial applicator companies use similar active ingredients.
- Some offer different programs that they may advertise as natural or organic.
- Regardless of the type of program, all can have similar non-target effects if not applied properly or overused.



Effects on birds

- Rodenticides pose the highest risk to birds of prey.
- Many insecticides may be directly toxic to birds.
- Btk, used for caterpillar control, is not toxic to other insect types or birds.
- Birds are not likely to feed on dead insects; they rely on movement to find prey and avoid eating dead stuff.
- Water sources for birds are highly unlikely to be contaminated with pesticides.
- Most impacts on birds come from habitat destruction and lack of food because we grow non-native plants.



What are those black boxes?

- Rodent bait boxes are commonly used around restaurants, grocery stores and anywhere that food or feed is sold or stored.
- Warfarin is a 1st-generation anticoagulant that is rarely used now because rats have become resistant to it.
- Currently, most rodenticides are 2nd generation anticoagulants or bromethalin or vitamin D
- All of these rodenticides can cause secondary exposure of birds and mammals, sometimes fatal.
- Public health rules require rodents to be managed, and more work needs to be done on promoting rodent IPM.

Table 1. Active ingredients in rodenticides used in California.

Active Ingredient	Rodenticide class
Chlorophacinone Diphacinone Warfarin	1st-generation anticoagulant
Brodifacoum Bromadiolone Difenacoum Difethialone	2nd generation anticoagulant*
Bromethalin Cholecalciferol	Non-anticoagulant rodenticide

*All 2nd generation anticoagulants are considered restricted use pesticides and therefore can only be purchased and applied by a licensed applicator.

Rodenticides Continued

- BPC made second-generation rodenticides RUPs
- Homeowners or business can ask about the pesticides used to manage rodents
- IPM should always be used, including exclusion and sanitation, before rodenticides are deployed.



Islands and arboviruses

- Arboviruses – insect or tick-vectored diseases on islands.
- EEE, WNV, JCV and other mosquito-borne diseases are dependent on the vectors present in the area.
- Most mosquitoes do not travel long distances.
- The mix of species is different in salt marshes.
- The *Aedes* mosquitoes found in salt marshes are bridge vectors for EEE and JCV, less so for WNV
- Bridge vectors bite both bird carriers and humans.
- Hardwood swamps harbor the *Culiseta melanura* mosquitoes that infect the bird carriers.

Resources

npic NATIONAL PESTICIDE INFORMATION CENTER

https://npic.orst.edu/

BOARD OF PESTICIDES CONTROL · STATE OF MAINE · Think First... Spray Last!

https://www.maine.gov/dacf/php/pesticides/public/index.shtml

Conclusions

- Pesticide risk = toxicity x exposure
- All forms of pest management pose unintended consequences
- Natural products are not inherently safe or safer
- Conventional pesticides are not inherently riskier or unsafe
- Most risks are site-specific and are a result of improper use
- High-risk pests may justify higher risk management strategies


Thanks for loving our Maine Ecosystems
Department of
Agriculture Conservation & Forestry