RESOLUTION #2026-0202

A RESOLUTION ADOPTING THE VILLAGE OF BALD HEAD ISLAND INTEGRATED PEST MANAGEMENT (IPM) PLAN

WHEREAS, the Village of Bald Head Island is a Bee City USA and is required to have an Integrated Pest Management Plan to participate in the program; and

WHEREAS, the purpose of an Integrated Pest Management Plan is to maintain healthy landscapes and minimize risk to people and the environment by using prevention first methods for insect and pests rather than the routine use of pesticides that harm people and pollinators; and

WHEREAS, the Village of Bald Head Island's Integrated Pest Management Plan balances the use of cultural and insecticidal methods and habitat manipulations to minimize environmental impacts associated with the Village's Mosquito Management Program.

NOW THEREFORE, IT IS HEREBY RESOLVED, by the Village of Bald Head Island as follows:

1. The Village of Bald Head Island Integrated Pest Management Plan attached hereto as Exhibit "A" is hereby adopted.

ADOPTED this the 4th day of February by Village of Bald Head Island Village Council.

Peter Quinn, Mayor

ATTEST:

Darcy Sperry, Village Clerk

VILLAGE OF BALD HEAD ISLAND SEAL NORTH CAROLINA

Adopted 2/4/2026

INTEGRATED PEST MANAGEMENT PLAN

VILLAGE OF BALD HEAD ISLAND

INTRODUCTION

Since the need for mosquito control was recognized in the early twentieth century, increased knowledge of mosquito biology has driven the formulation of a variety of methodologies designed to successfully reduce both mosquito nuisance levels and mosquito-borne disease transmission. As the technologies and knowledge base from which these methodologies were derived have matured, they have been increasingly seen as mostly complimentary or synergistic in nature, providing optimal control as part of an overall strategy. This has ultimately evolved into a strategy termed Integrated Pest Management (IPM). IPM was developed to encourage a balanced usage of cultural and insecticidal methodologies and habitat manipulations in order to minimize adverse environmental impacts. IPM is knowledge-based and surveillance-driven, and when properly practiced is specifically designed to accomplish the following:

1. Protect human, animal, and environmental health.
2. Promote a rational use of pesticides.
3. Reduce environmental contamination to soil, ground water, surface water, pollinators, wildlife, and endangered species.
4. Utilize natural biological controls to conserve and augment other control methods.
5. Use target specific pesticides to the extent possible.
6. Emphasize the proper timing of applications.
7. Minimize pesticide resistance problems.

Because each jurisdiction is unique in terms of available resources, topography, hydrology, and the variety of mosquito species, considerable judgement must be exercised in allocation of resources to have the maximum benefit for both the public and environment. Program funding will help dictate the extent to which jurisdictions can implement the management practices described herein.

The practices used at the Village of Bald Head Island shall be performed in concert with any National Pollution Discharge Elimination System (NPDES) permits.

The Village of Bald Head Island has incorporated many of the Best Management Practices adopted by the American Mosquito Control Association. Adherence to these BMPs to the maximum extent practicable is to be considered the necessary minimum to perform to meet regulatory compliance with NPDES for mosquitocide use.

Adopted 2/4/2026

Best Management Practices for Mosquito Management

The Village of Bald Head Island may not have all of the resources to practice all of the specific sub-elements discussed herein. But we will strive to adhere to the recommended Best Management Practices to the maximum extent practicable. There are 9 components listed below.

1. **Surveillance** - This is the most important component to the Village's IPM plan. Performing surveillance helps identify problem species and population trends in order to direct and evaluate control methods.

    a. Visually check for potential large-scale larval habitats and populations that could contribute to unacceptable adult mosquito populations and determine if larval control is appropriate within any present constraints.

        1. Rural-swamps, salt & freshwater marshes, woodland pools, flooded fields/pastures, roadside ditches, storm water retention ponds, tree holes, rice fields, etc.

        2. Urban-flower pots, tires, trash containers holding water, gutters, tree holes, septic ditches, roadside ditches, lawn swales, non-functional swimming pools, stagnant bird baths, street catch basins, junk yards, boats, canoes, kayaks, depressions in tarp covers, etc.

    b. Determine population levels of adult mosquitos using professionally acceptable techniques, including public complaints, or landing rate counts, to establish needs for action.

    c. Determine if problem species are peri-domestic. Peri-domestic mosquito species oviposit primarily in containers around human habitation. Their presence as the primary pest species will dictate prevention/control strategies directed toward removal of oviposition sites through public education.

2. **Mapping** - Utilize Village/county maps to continually monitor major sources of larval/adult mosquitoes in addition to areas where control measures have been instituted.

3. Also included in the mapping, are the locations of active bee hives, and pollinator gardens. **Set Action Thresholds** - Decisions to apply to public health pesticides should be based on the analysis of either larval or adult mosquito surveillance data. Programs must establish a mechanism on which decisions to institute control measures are based.

a. Determine which methodology shall be used to determine if and when control measures are instituted.

1. For larval mosquito control this methodology can consist of numbers of larvae observed in larval dip counts or observation of larval presence in water sources.

2. For adult mosquito control this methodology can consist of:

i. Number and pattern of citizen's service request.
ii. Visual-numbers of mosquitoes landing on inspector within 1-minute periods. When practicable, landing rate counts should be taken near or at times of peak mosquito activity for the species on concern. Performance of landing rate counts is only advised in areas or at times without significant mosquito-borne disease activity.
iii. The Village of Bald Head Island uses the action threshold of 7 mosquitoes landing within 1-minute.

b. Determine threshold values that trigger control measures.

4. **Physical Control or Source Reduction** - Source reduction (the elimination, removal, or reduction of larval mosquito habitats) typically is the most effective and economical long-term method of mosquito control, but this may not be practicable for many larval habitats. Source reduction can be as simple as overturning a discarded bucket or disposing of a waste tire. These efforts often minimize and/or eliminate the need for mosquito larvaciding in the affected habitat in addition to greatly reducing the need for adulticiding in nearby areas.

a. Determine feasibility of removing or modifying oviposition sites.

b. Coordinate internally with Public Services staff for ditch/impoundment maintenance.

c. Maintain familiarization with jurisdiction health nuisance abatement policy.

5. **Biological Control** - These control methodologies are often resource-intensive and not usually practicable for many programs. Nonetheless, their feasibility should be explored.

a. Stocking of certain species of fish known to be predators of mosquito larvae, if allowed by applicable state or local authorities, may provide significant reductions in larval mosquito populations in basic programs where management of large perennial oviposition sites is to be the primary control strategy.

i. In areas where it is feasible, the use of fish and other biological controls is encouraged.

b. Utilization of bats, birds, dragonflies, and other putative predators of mosquitoes is both ecologically problematic and ineffective as a primary control strategy and is therefore not recommended as a major component of any control strategy.

6. **Chemical Control** - Handling, disposal, personal protective measures, and applications must be made in full accordance with product label specifications.

a. Larvicides - Often may be the primary control method in natural or man-made wetlands (salt-marshes or tidal wetlands, riverine bottomlands, woodland pools, freshwater marshes, meadow swales, roadside ditches, stormwater management ponds, etc.). These can also be a primary control method in locations where mosquito populations are determined to be arising from defined, concentrated sources in urban areas or in close proximity to houses. Due to continual influx of adult mosquitoes from outlying areas, larvaciding programs may have limited visible effect of mosquito populations in jurisdictions lacking resources to adequately larvicide outlying production areas.

1. Several materials in various formulations registered by EPA are labeled for mosquito larvaciding. Choice of active ingredient and formulation chosen will depend on site-specific factors and resistance management, and may include:

   i. Organophosphate-temephos
   ii. Microbial larvicides-Bacillus thuringiensis israelensis (Bti) and Bacillus sphaericus (Bs)
   iii. Growth regulators-methoprene
   iv. Monomolecular surface films
   v. Oils-petroleum or mineral-based
   vi. Chitin synthesis inhibitors-diflubenzuron

2. Larvicides, if used, should be specific for mosquitoes, minimize impacts to non-target organisms and must, in many instances, be capable or penetrating dense vegetative canopies. Larvicide formulations (e.g., liquid, granular, solid) must be appropriate to the habitat being treated, accurately applied, and based on surveillance data.

3. Larvicide application equipment should be calibrated and maintained per equipment manufacturer’s specifications and timetable, or per instructions from product registrant.

4. Larvicide application should be used within 2-3 days of seeing larvae. Most typically, a product such as Natular T30 tablets will be used. Because there is no action threshold for larvae, any number of larvae that are counted can be treated. Natular T30 tablets are extended release and are activated when water is present. The active ingredient Is biologically derived from the fermentation of a naturally occurring soil organism.

b. Pupacides - Can be used on mosquito populations that are in the pupa phase of development, similar to a chrysalis. Neem oil is often added to a water source when pupae are present. Neem oil is a natural product extracted from the *Azadirachta indica* tree. Neem oil is used in hundreds of pesticide products and is applied to a wide variety of crops and ornamental plants for insect control. Within one week of applying a pupacide, an adulticide should be used to eliminate any remaining mosquitoes.

c. Adulticides - Adulticiding based on surveillance data is an extremely important part of any IPM program, and often forms the primary treatment method for basic programs. In fact, the general public typically associates basic mosquito control programs with spray trucks or “foggers,” not realizing the existence or importance of the other parts of the IPM. Adulticides are applied so as to impinge upon the mosquito target in flight or at rest on vegetation.

Adulticides utilized in basic programs are typically applied as an Ultra-Low-Volume (ULV) spray where small amounts of insecticide are dispersed by aircraft or truck-mounted equipment. A vast majority of mosquito control programs don’t have aerial application capabilities, but most have some type of ground delivery system for adulticiding. In some jurisdictions, adulticides may also be applied via “thermal fogs”, utilizing heat to atomize droplets. Adult mosquitoes may also be targeted by “barrier treatments”, which involve application of a residual insecticide to vegetation where mosquitoes are known to rest.

1. Adulticides should only be applied when established spray thresholds have been exceeded.

2. Non-residual adulticides applied to the air column in order to impinge upon mosquitoes in flight should only be applied when the target species is active.

3. Adulticides should be applied strictly according to label specifications. This will produce minimal effects on non-target organisms and promote efficacy. Adulticides should not be applied in rainy or windy conditions.

4. Adulticides should be applied by personnel trained or certified in their usage and handling, or when operating under the supervision of an individual having state certification.

5. Adulticides labeled for mosquito control in part may include:
    i. Organophosphates-malathion and naled
    ii. Natural pyrethrins
    iii. Pyrethroids-permethrin, resmethrin and sumithrin
    iv. Pyrethroid derivatives-etofenprox

6. Adulticides should be applied at label rates that are efficacious as determined by monitoring. Applying doses lower than those that provide adequate control can in fact result in the need for additional adulticide treatments and can also encourage insecticide resistance by treating with sub-lethal doses.

c. Adulticide application equipment should be calibrated and maintained per equipment manufacturer's specifications and timetable, or per instructions from the product registrant.

7. Monitoring for Efficacy/Resistance- Resistance management techniques attempt to minimize the risk of mosquitoes becoming resistant to the existing chemicals and should be practiced in even basic programs.

a. Basic resistance management techniques can include:

i. Do not use the same class of chemical against both immature and adult mosquitoes.

ii. Apply pesticide at rate recommended on the label. Do not underdose.

iii. When possible, utilize a different chemical class at the beginning and end of treatment season.

iv. If possible, assess susceptibility at the beginning and sometime during the mosquito season.

b. Resistance management can also involve utilizing surveillance methods following larvicide or adulticide applications to continually check for control efficacy.

8. Public Education & Community Outreach - Education of the general public should be encouraged to teach residents how they can aid in mosquito control by disposing of (or modifying) containers.

a. The public should be notified via appropriate means of upcoming spray operations as soon as the need is determined.

b. Beekeepers not wishing their premises to be treated should be notified of any adulticiding operations per label specifications prior to application operations.

c. Pesticides will not be used in pollinator gardens.

Record-keeping-Operators/applicators should record the following for each application and maintain the records for the time specified by the lead regulatory agency:
Applcator's name, address, and pesticide applicator certification number (if applicable)

a. Application date and time of day
b. Product name and EPA registration number
c. General location of application and approximate size of area treated
d. Amount of material applied
e. Application rate

PRACTICAL APPLICATION

It is the goal of the Village of Bald Head Island to be proactive in pest management practices. Using the mapping system, Village staff will identify areas of concern earlier in the year. At the discretion of the Pest Control Technician and with the guidance of Brunswick County Mosquito Control, the areas of concern may be treated in advance of any customer complaints. A record of citizen complaints will be maintained, to better track areas of concern. This record becomes a tool for future pesticide use.

The Village wishes to apply the minimum volume of pesticides possible, while maximizing efficacy. This includes using a combination of the Best Management Practices for each area and specific situation.