



# Hernando County Mosquito Control Products

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# Federal Law

- ▶ Environmental Protection Agency
  - ▶ FIFRA: The Federal Insecticide, Fungicide, and Rodenticide Act is a United States federal law that set up the basic U.S. system of pesticide regulation to protect applicators, consumers, and the environment.
  - ▶ A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, or intended for use as a plant regulator, defoliant, or desiccant, or desiccant, or any nitrogen stabilizer.
    - ▶ This is true even if the substance being used is a naturally occurring soil bacterium, it's the fact that it is used to control a pest that makes it a pesticide.

# THE LABEL IS THE LAW

All registered pesticide products must display labels that show the following information clearly and prominently:

- Name, brand, or trademark product sold under
- Name and address of the producer or registrant
- Net contents
- Product registration number
- Producing establishment's number
- Ingredient statement
- Warning or precautionary statements
- Directions for use
- Use classification

SPECIMEN LABEL — SPECIMEN LABEL — SPECIMEN LABEL — SPECIMEN LABEL — SPECIMEN LABEL

**Summit** ...responsible solutions.

EACH DUNK® KILLS MOSQUITOES FOR 30 DAYS or More.

BIOLOGICAL  
MOSQUITO CONTROL



Can be Used in Fish Habitats

Place in Containerized Standing Water

Wherever It Accumulates Near the Household:  
Flower Pots • Tree Holes • Bird Houses • Rain Barrels • Roof Gutters •  
Old Tires • Unused Swimming Pools • Animal Watering Troughs

ACTIVE INGREDIENTS: *Bacillus thuringiensis* sub-species israelensis strain  
BMP 144 solids, spores and insecticidal toxins\* ..... 10.31%  
INERT INGREDIENTS: ..... 89.69%  
TOTAL ..... 100 %

\*Net wt. 7000 Acres (regd) (AA) International Toxic Units (TU) per milligram primary powder.  
The above active ingredient does not include product performance and potency measurements and  
net kit weight standard.

EPA Registration No. 6218-47 EPA Est. No. 6218 MD 2

MADE IN USA

MOSQUITO BITS®, MOSQUITO DUNKS® are registered trademarks  
of Summit Chemical Co.

**KEEP OUT OF REACH OF CHILDREN  
CAUTION**

**Summit**  
...responsible solutions.

330 South Truman Street, Summit, MO 20726  
800-227-0664 | 416-522-0851  
Bifenthrin is a trademark of Sumitomo Chemical Co.

ATTENTION: This specimen label is provided for informational  
use only. This product may not yet be available for sale in your  
state or area. The information found in this label may differ  
from the information found on the product label you are using.  
Always follow the instructions for use and precautions on the  
label of the product you are using.

Biological Mosquito Control  
**Mosquito Dunks®**

EACH DUNK® KILLS MOSQUITOES FOR 30 DAYS or LONGER

PRECAUTIONARY STATEMENTS

Hazard to Humans: Avoid breathing dust. Causes moderate  
eye irritation. Avoid contact with eyes or clothing. Wash  
thoroughly with soap and water after handling and before  
eating, drinking, chewing gum, using tobacco or using the  
toilet.

Environmental Hazards: Do not apply directly to treated,  
finished drinking water reservoirs or drinking water receptacles  
when the water is intended for human consumption.

FIRST AID

<b>F IN EYES:</b>	<ul style="list-style-type: none"> <li>• Hold eye open, and rinse slowly and gently with water for 15-20 minutes.</li> <li>• Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.</li> <li>• Call a poison center or call a poison control center or doctor for treatment advice.</li> </ul>
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HOT LINE NUMBER

Have the product container or label with you when calling a poison  
control center or doctor, or going for treatment. You may also contact  
1-800-222-1222 for emergency medical treatment information.

GENERAL INFORMATION

MOSQUITO DUNKS® float on water and will keep on working  
for 30 days or longer under typical environmental conditions.  
While floating, they slowly release a long-term, biological  
mosquito larvicide at the water's surface. This larvicide  
gradually settles in the water where it is eaten by mosquito  
larvae growing there. MOSQUITO DUNKS® may be used in  
all types of containerized standing water sites, except finished,  
treated drinking water, where mosquito larvae grow. Alternate  
wetting and drying will not reduce their effectiveness.

DIRECTIONS FOR USE

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

OUTDOOR USE AROUND THE HOUSE

Use one (1) MOSQUITO DUNK® for up to 100 square feet of  
water surface, regardless of depth. They can be used whole or  
broken into portions and applied to containerized standing  
water found near the home such as:

- Bird Baths
- Unused swimming pools
- Flower pots
- Rain barrels and roof gutters
- Tree Holes
- Animal watering troughs
- Old automobile tires
- Water Gardens

MOSQUITO DUNKS® can be used in any containerized  
standing water, except finished, treated drinking water found  
near the home.

# State Laws

## Statute 388

- Mosquito control is not mandatory for every county
- These laws provide public policy for arthropod control, power to perform work, and power to do all things necessary
- Covers mileage, commissioners, requirements, State aid, equipment, budget reporting, Florida Medical Entomology Lab, Florida Coordinating Council on Mosquito Control

## Administrative Code 5E-13

- More specific
- 13.036
  - Ensures adulticiding applications are made only when necessary
  - Demonstrable increase must be verified through surveillance
    - Trapping
    - Landing Rates
    - Visual Confirmation
  - All surveillance and treatment records retained for 3 years.
  - For HCMC, we also take into consideration the species with high numbers in our traps

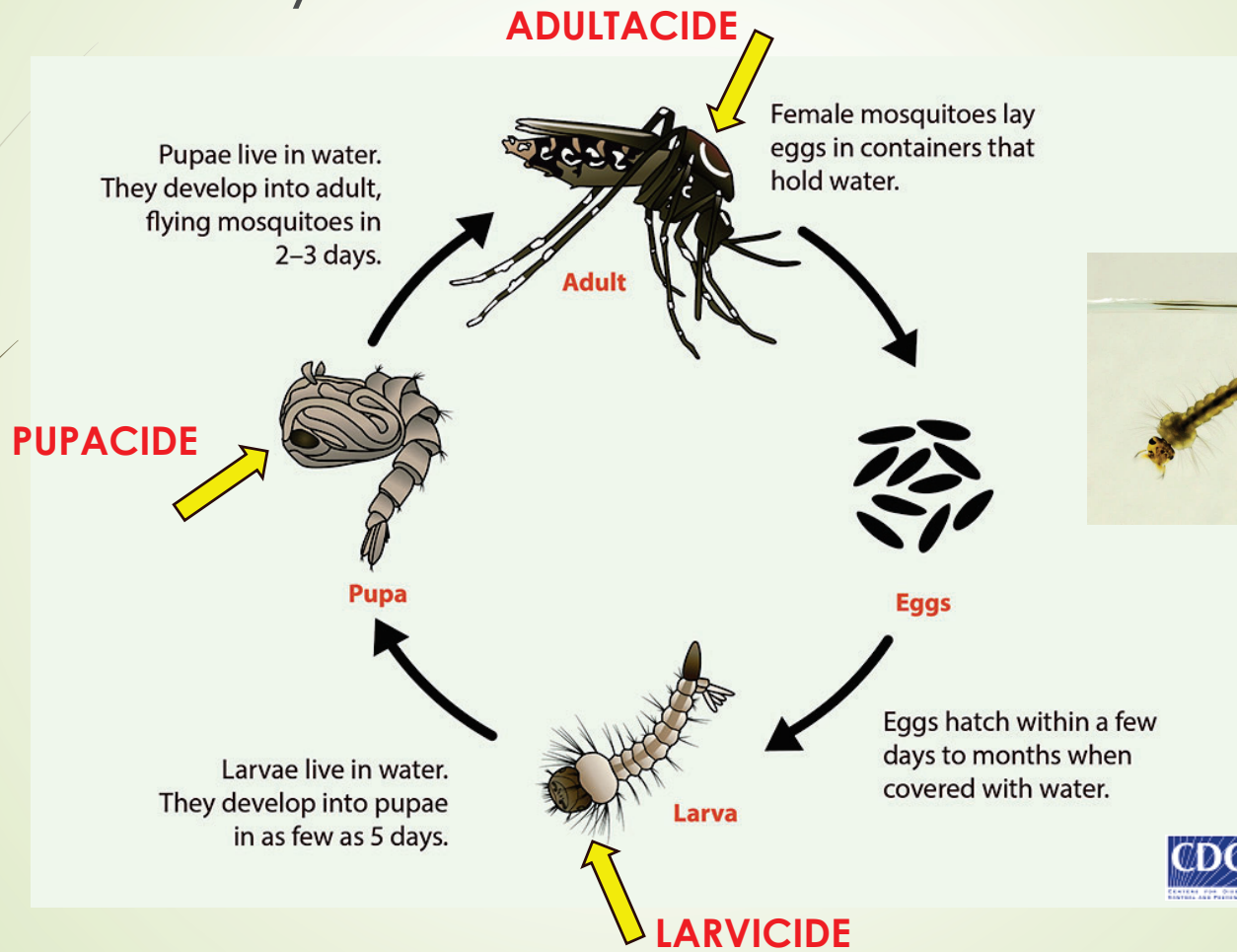
CHAPTER 388  
MOSQUITO CONTROL

388.010 Declaration of legislative intent.  
388.011 Definitions.  
388.021 Creation of mosquito control districts.  
388.101 District boards of commissioners; term of office.  
388.111 District boards of commissioners; vacancies.  
388.121 District boards of commissioners; organization.  
388.123 Commissioners; bond.  
388.141 Commissioners; compensation.  
388.151 District boards of commissioners; meetings.  
388.161 District boards of commissioners; powers and duties.  
388.162 Direction of the program.  
388.171 Power to perform work.  
388.181 Power to do all things necessary.  
388.201 District budgets; hearing.  
388.211 Change in district boundaries.  
388.221 Tax levy.  
388.231 Restrictions on use, loan, or rental of equipment; charges.  
388.241 Board of county commissioners vested with powers and duties of board of commissioners in certain counties.  
388.251 Delegation of authority to county health department.  
388.301 State aid to counties and districts for arthropod control; distribution priorities and limitations.  
388.271 Prerequisites to participation.  
388.281 Use of state matching funds.  
388.291 Source reduction measures; supervision by department.  
388.301 Payment of state funds; supplies and services.  
388.311 Carry over of state funds and local funds.  
388.321 Equipment to become property of the county or district.  
388.322 Record and inventory of certain property.  
388.323 Disposal of surplus property.  
388.341 Reports of expenditures and accomplishments.  
388.351 Transfer of equipment, personnel, and supplies during an emergency.  
388.361 Department authority and rules; administration.  
388.371 Enforcement.  
388.381 Cooperation by counties and district.  
388.391 Control measures in municipalities and portions of counties located outside boundaries of districts.  
388.401 Penalty for damage to property or operations.  
388.411 Public lands; arthropod control.  
388.43 Florida Medical Entomology Laboratory.  
388.45 Threat to public or animal health; declarations.  
388.46 Florida Coordinating Council on Mosquito Control; establishment; membership; organization; responsibilities.

CHAPTER 5E-13  
MOSQUITO CONTROL PROGRAM ADMINISTRATION

5E-13.021 Definitions  
5E-13.022 Eligibility for State Approved Program and/or Aid  
5E-13.027 Certified Budgets, Filing  
5E-13.030 State Aid Basis and Availability  
5E-13.031 District or County Use of Funds  
5E-13.032 Program Directors, Employment and Classification  
5E-13.0331 Use of Pesticides for Arthropod Control, Labels, Limitations, Precautions and Storage  
5E-13.034 Penalty for Failure to Comply with Public Law 92-516, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of the U. S. Environmental Protection Agency and Their Rules  
5E-13.036 Demonstrable Increase or Other Indicator of Arthropod Population Level  
5E-13.037 Aircraft Application for the Control of Adult Arthropods  
5E-13.0371 Mosquito Control Aircraft Registration, Inspection, Security, Storage, Transactions, Recordkeeping, Area-of-Application Information and Forms  
5E-13.039 Protection of Natural Resources and of the Health, Safety, and Welfare of Arthropod Control Employees and the General Public  
5E-13.040 Criteria for Licensure or Certification of Applicators  
5E-13.041 Authorization for the Department to Promulgate Rules and Regulations More Stringent Than EPA (Repealed)  
5E-13.042 Criteria for Arthropod Control That May Affect Environmentally Sensitive and Biologically Productive Public Lands and Other Public Lands

# Life Cycle



# Larvicides

- Bio-rational control - materials that are relatively non-toxic with few ecological side effects
- All of our larvicides are non-toxic to humans
- **Bti - *Bacillus thuringiensis israelensis*, Bs-*Bacillus sphaericus*, *Saccharopolyspora spinosa* (Spinosad)**
  - Naturally occurring soil bacteria
  - Either ingested through feeding and/or by contact
  - Bti/Bs produce a protein as crystals or spores that attack the gut wall, paralyzing the larvae
  - Spinosad attacks the nervous system
  - Species specific, breaks down rapidly, limited non-target impacts
  - Non-toxic to humans, other mammals, fish, birds, beneficial insects, plants, and most aquatic organisms (not black fly larvae)
    - They are ineffective in acidic digestive systems like dragonfly nymphs
  - Trade names-Vectobac, AquaBac, Fourstar, Vectolex, Vectomax, Natular




Control healthy larva (a) and larva after 1 h exposure to Bti (b). Note in b the damage caused by the Bti, which can be seen in the form of openings and empty space created.

Alba-Tercedor, J., Vilchez, S. Anatomical damage caused by *Bacillus thuringiensis* variety *israelensis* in yellow fever mosquito *Aedes aegypti* (L.) larvae revealed by micro-computed tomography. *Sci Rep* **13**, 8759 (2023)



# Formulations

APPEARANCE	FORMULATION TYPE	LENGTH OF CONTROL
	Liquid	Single brood
	Liquid suspension concentrate	Single brood
	Corn cob granule	Single brood, 7+ days
	Silica granule	Multi brood, 30 days
	Silica granule in water soluble pouch	Multi brood, 30 days
	Dust-free tablet	Multi brood, 30 days
	Dust-free tablet	Multi brood, 180 days
	Bi-layer tablet	Multi brood, 60 days





# Natular in Action





# IGR – Insect Growth Regulators

- Methoprene and Pyriproxyfen
  - Mimics the juvenile growth hormones that occur in an insect's body. Natural hormones control how long an insect remains in each larval or nymphal stage. IGRs stop further maturation.
  - Very common in flea and tick control, other pesticides for pest control
- Trade names
  - Altosid
  - Nyguard



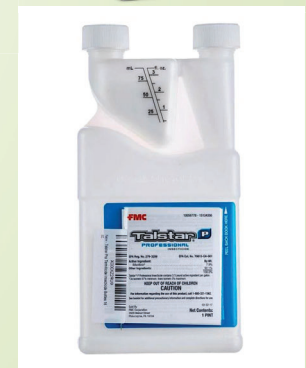
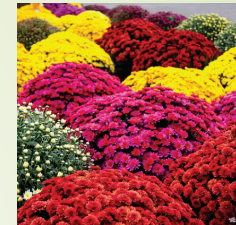
# Pupacide

- Pupae do not feed
- Monomolecular films create a slick on the water's surface that clogs the pupae's breathing tubes
- They work on larvae as well, but selectively used for pupae
- Trade name – Cocobear
  - 10% Mineral oil
  - Used in very small amounts



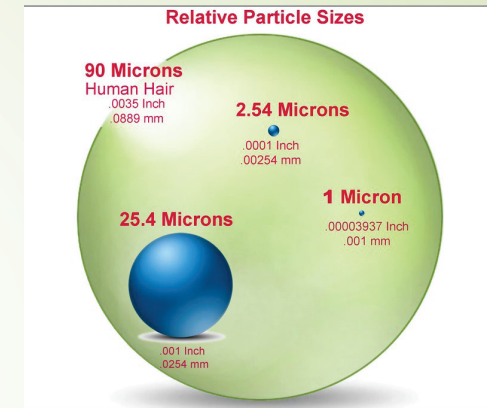
# Adulticides

- ▶ Last resort when adult populations have increased, and evidenced through observation, landing rate counts or trap counts
- ▶ Only applied in the evenings and early morning hours when beneficial insects are not active but mosquitoes are
- ▶ One class of adulticides is Pyrethrin, a mixture of six chemicals that are toxic to insects. They are found naturally in some chrysanthemum flowers.
  - ▶ For ULV we use synthetic/man-made pyrethrins called pyrethroids which work by preventing their nervous systems from working properly
  - ▶ DUET used in the trucks- a combination of two pyrethroid active ingredients of sumithrin and prallethrin with piperonyl butoxide (a synergist that improves the efficacy of pyrethroids)
  - ▶ Aqua Zenivex and Aqua DUET are used in backpack/space sprays, active ingredient is Etofenprox.
  - ▶ We also use tau-fluvalinate and Bifenthrin, broad-spectrum pesticides for small area barrier sprays on non-flowering vegetation



# ULV and Particle Size

- ▶ ULV stands for ultra-low volume because of the low volume of fluid that is required to create enough fog to cover very large areas.
- ▶ Large volumes of air at low pressure converts a liquid into droplets that can then be dispersed into the atmosphere.
- ▶ Label requires DUET volume median diameter (VMD) of droplets be between 8 and 30 microns and that 90% of the spray is contained in droplets smaller than 50 microns.
- ▶ Our trucks VMD is 13-20 microns, with 90% at 33 microns. Backpack VMDs average 8 microns.
- ▶ DUET contains 0.075 lbs of Prallethrin/Gallon, 0.375 lbs of Sumithrin/Gallon and 0.375 lbs of Piperonyl Butoxide (PBO)/Gallon
- ▶ Calibration and droplet analysis performed annually.



DUET application rate is 1 oz/acre



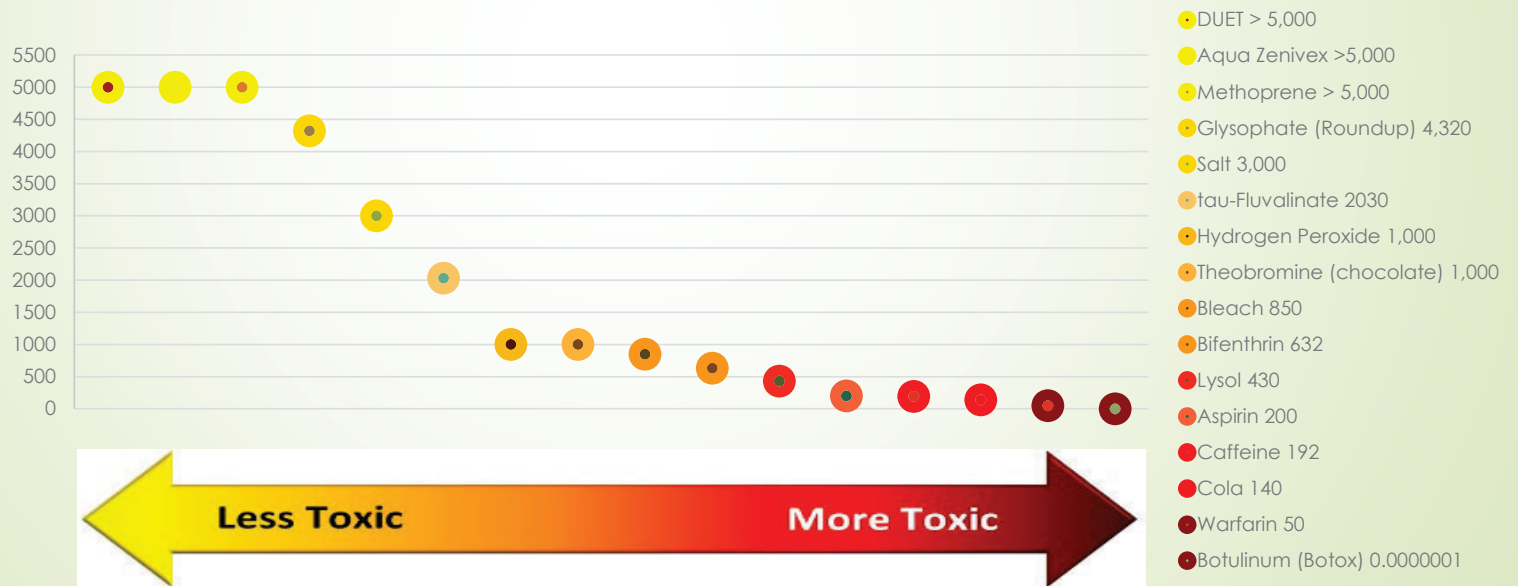
# Pesticide Usage

Year	Larvicides					Adulcicides			Other		
	Gallons	Pounds	Pouch/Briquet	Acres	# Treatments	Aldulticide	Acres	# Treatments	Fish	Dump	# Treatments
2023	4.76	297	1,121	190	1,131	122.77	15,890	602, 36 by truck	447	1,430	328
2022	4.67	633	1,246	300	1,494	154.56	16,249	476, 37 by truck	827	670	282
2021	3.67	1,120	3,140	351	3,268	160.15	23,494	638, 57 by truck	946	734	312
2020	4.52	530	2,897	551	2,913	160.28	22,149	535, 54 by truck	1,299	729	375
2019	5.36	783	2,571	534	2,239	205.35	26,688	326, 37 by truck	1,230	551	290

# Toxicity and Lethal Dose

- Lethal dose (LD50) is **the amount of an ingested substance that kills 50 percent of a test sample**. It is expressed in milligrams per kilogram of weight. mg/kg.
- Pesticides are tested on a number of animals, the LD50s I am sharing used rats for all of them, the most common test subjects.
- The lower the number the more toxic it is because it takes less of the substance to kill the subjects.

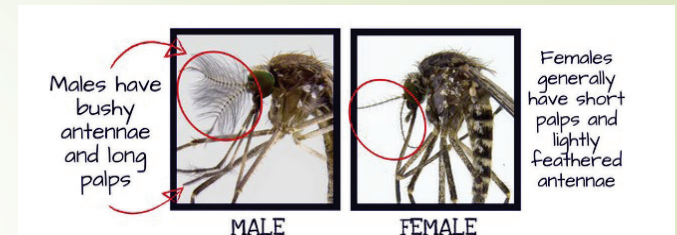
Milligrams per  
Kilograms of  
Weight



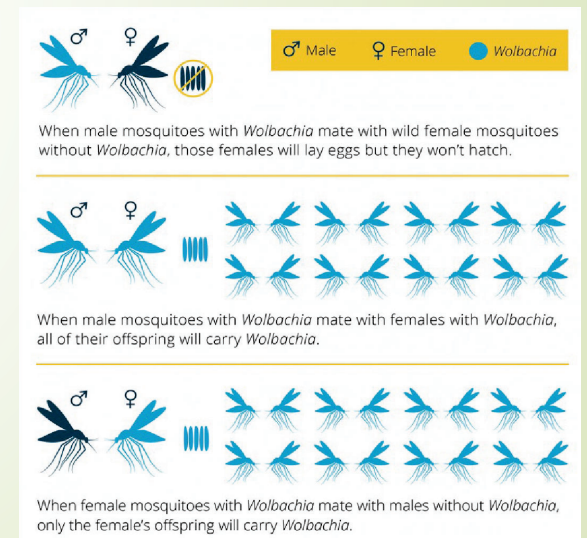
# Non-chemical methods of control

## ➤ Wolbachia

- Wolbachia is an insect bacterium, that does not infect humans or animals
- Over 60% of insects infected, primarily in the Order Diptera (sand flies, blowflies, House Fly, midges, some mosquito species)
- No genetic engineering
- Only female mosquitoes bite. Male mosquitoes do not bite. Both feed on nectar.
- *Wolbachia* introduced to *Ae. aegypti* mosquito eggs, they are reared to adults, separated by sex, then only the males are released from the ground. Females may be kept for breeding or destroyed.
- When male *Ae. aegypti* mosquitoes with *Wolbachia* mate with wild female mosquitoes that do not have *Wolbachia*, the eggs will not hatch.
- Reduces the ability of mosquitoes to transmit disease, not just by lowering the population but also by making it harder for the viruses to reproduce inside the mosquito.



\*Government of Western Australia  
Department of Health



\*EliminateDengue.com

# Sterile Insect Technique

- Public Health, Agriculture & Livestock- tsetse fly (African trypanosomiasis, also known as sleeping sickness), mosquitoes, Screwworms, Fruit Flies, Pink Bollworm, Codling Moth
- No genetic engineering
- Mosquitoes are reared from eggs and separated by sex
- Males are sterilized in a lab with radiation then released to mate with females, but no offspring are produced.

Public Health

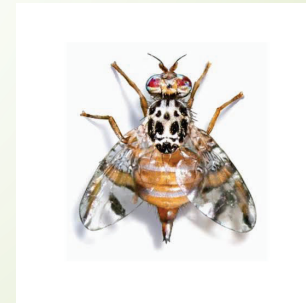


Livestock



\*Entomology Today

Agriculture

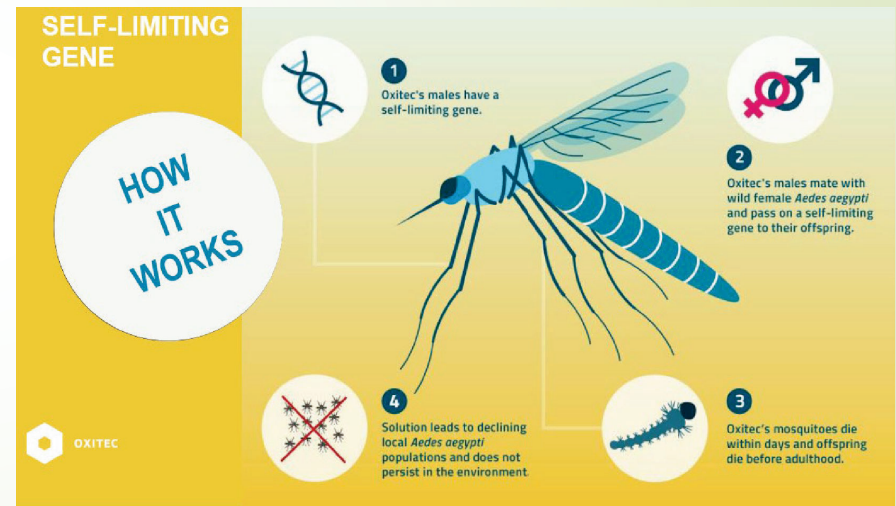


\*Insect Science



# Genetically Modified Mosquitoes- Oxitec

- Only used in the Florida Keys in the US- required review and permitting by the EPA
- Self-limiting gene inserted from other organisms
- Repressed with an antidote (tetracycline) during insect production
- In the presence of tetracycline, the insects survive and reproduce in the rearing facility; however, when the males are released into the wild, their offspring cannot access the antibiotic and they die before becoming adults.
- Gene is inherited: Offspring do not survive to adulthood
- After releases stop, genes do not persist in the environment





## HC Mosquito Control

- ▶ We do not have the budget or capability to deploy any of these methods of control
  - ▶ The first two require large facilities with insectaries and dedicated staff.
  - ▶ Oxitec is a purchased service, not prepared by the district.



# Aquatic Weed Treatments

- ▶ When requested by Waterways
- ▶ All technicians are licensed in aquatic weed treatments
- ▶ Last treatments were Hunter's Lake in 2021, and Hunter's Lake and Bystre Lake in 2022
- ▶ Herbicides
  - ▶ **Weedar 64** - 2, 4-Di-chloro-phenoxy-aceitic acid, dimethylamine salt 46.8%
    - ▶ Mimics natural plant growth hormones, overstimulates plant cells causing abnormal plant growth and death
    - ▶ Predominately toxic to broad leaf plants, much less toxic to mammals, birds, fish, reptiles, shellfish, insects, worms, fungi and bacteria
    - ▶ Does not occur in soils and water at levels harmful to animals and microorganisms, does not concentrate in foodchains or persist in croplands
    - ▶ Applied at 2 to 4 pints per acre, at 2 to 4 ppm
  - ▶ **Tribune** – Diquat dibromide 37.3%
    - ▶ Interferes with the photosynthesis within green plant tissue, also a growth inhibitor
    - ▶ Used at very low rates and safe for aquatic life, low to no bioconcentration
    - ▶ Applied at 0.25 to 0.5 gallons per acre, with concentrations up to 0.37 ppm



Thank you