



Agricultural &  
Environmental  
Solutions



# Midge Control in the Back River WWTP

Joe Iburg  
Technical Development Specialist

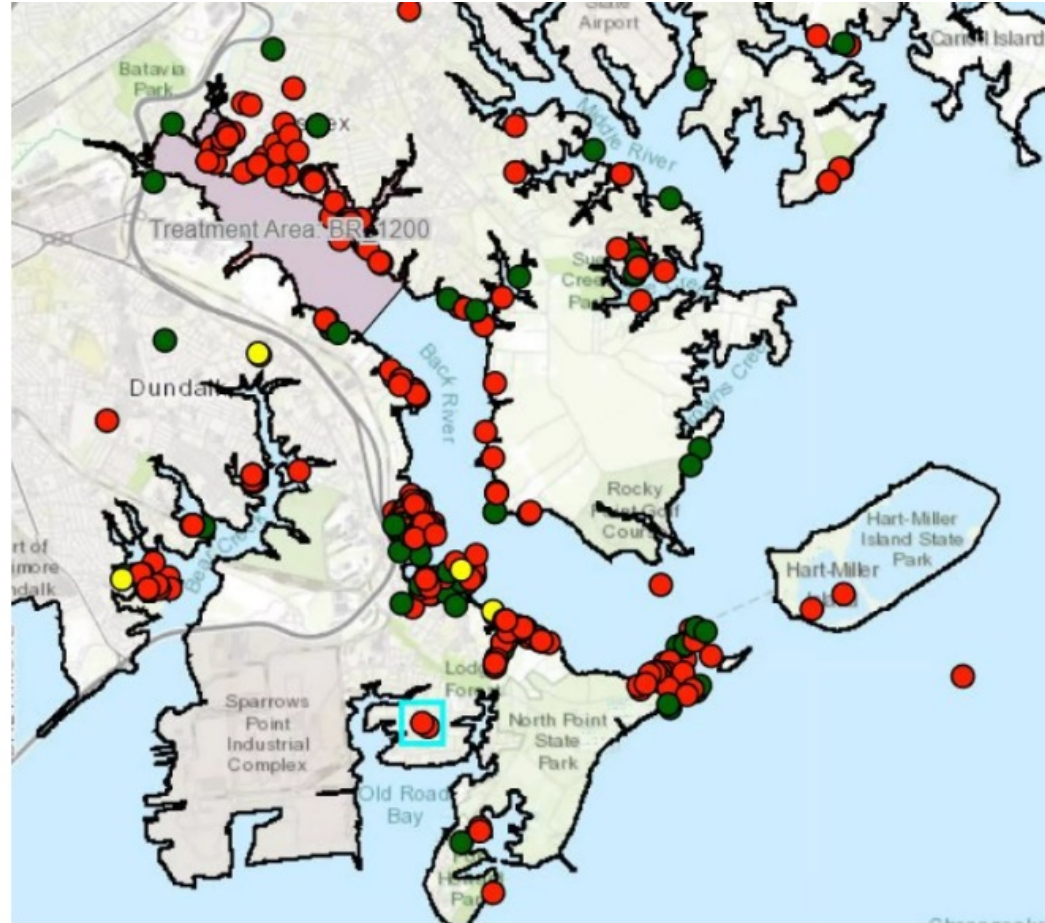
**Innovation  
through  
formulation**

# Baltimore County winning battles against midge swarms, war not over

WYPR - 88.1 FM Baltimore | By John Lee  
Published July 14, 2022 at 5:00 AM EDT



▶ LISTEN • 6:44



Complaints from residents about midges to Baltimore County are highest near the shore line.

www.wbaltv.com › article › spraying-for-midges-back-riv...

## Larvicide sprayed along Back River in effort to get rid of midges



... **Baltimore** County have been held hostage by a small bug called a Swarms of **midges**, which are small non-biting aquatic **flies** that ofte

WBAL TV · Apr 18, 2022

www.youtube.com › watch

## Larvicide sprayed along Back River in effort to get rid of midges



Over the past few summers, businesses, residents and tourists in th **River** area of **Baltimore** County have been held hostage by a small ..

YouTube · WBAL-TV 11 Baltimore · Apr 18, 2022

www.youtube.com › watch

## Baltimore County announces midge spraying along Back River



**Baltimore** County announces **midge** spraying along **Back River**. 127 year ago ...more. WMAR-2 News. 106K. Subscribe. 106K subscribers:

YouTube · WMAR-2 News · Apr 18, 2022

www.youtube.com › watch

## Baltimore County to announce midge spraying along Back River



**Baltimore** County to announce **midge** spraying along **Back River**. 1K year ago ...more. WMAR-2 News. 106K. Subscribe. 106K subscribers:

YouTube · WMAR-2 News · Apr 18, 2022

Dundalk Eagle

## Del. Long: Midge treatment underway at Back River plant

Baltimore County announced last week that it began treatment for midge larvae around Back River Wastewater Treatment Plant.

Jun 13, 2023

Dundalk Eagle

## Baltimore County to continue aerial spraying in Back River following success in midge control

Baltimore County will continue to suppress the pest population in Back River through aerial spray treatments.

Feb 7, 2023

WBAL TV

## Helicopters spray larvicide along Back River in effort to get rid of midges

Over the past few summers, businesses, residents and tourists in the Back River area of Baltimore County have been held hostage by a small...

Apr 18, 2022

WMAR

## Baltimore County announces midge spraying along Back River

ESSEX, Md (WMAR) – Relief is on the way for people who live, work or recreate near the Back River to keep nuisance flies away for the summer...

Apr 18, 2022















Photo of the massive communal spider web in Maryland. ENTOMOLOGICAL SOCIETY OF AMERICA; GREENE ET AL. 2018

### 107 Million Spiders Found in 4-Acre Nest at Baltimore Wastewater Plant



News » Animals  
© 11/05/2014 under Animals, Environment, News

SPIDERS IN THE NEWS

# Megaweb!

An industrial facility's colossal "arachnotopia" was fueled by its own midges

AL GREENE | DECEMBER 2015



Inside the Back River sand filtration facility, home of the largest communal web of orb-weaving spiders ever recorded.

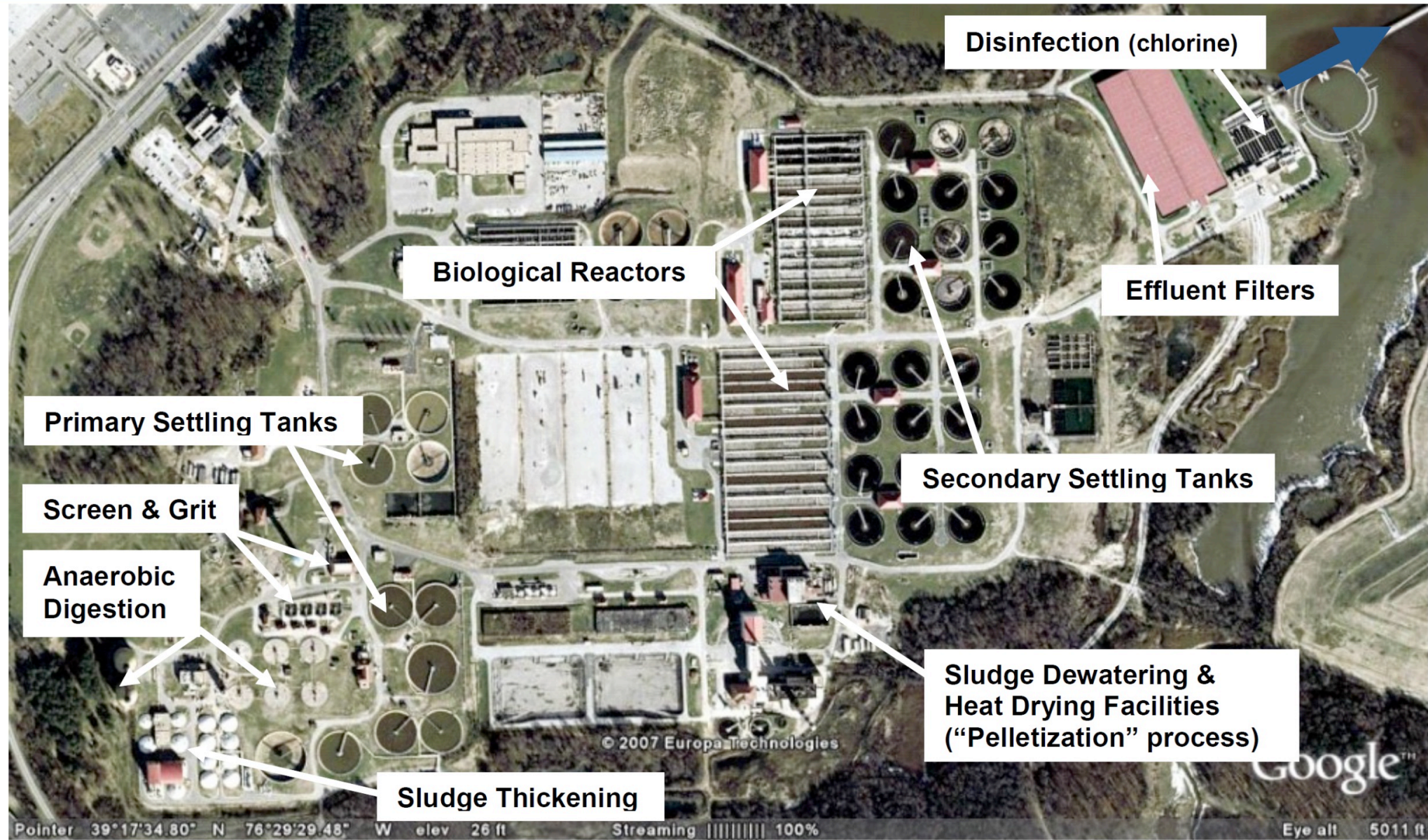


# Back River Wastewater Treatment Facility





# Back River Wastewater Treatment Facility







**Table 1. Pre-Treatment Samples**

11/1/2022

**pre-treat samples**

input canal near 17/19  
trough

input canal near 29/31  
trough

Trough 31

Trough 41

Trough 39

Trough 23

Trough 17

Trough 11

Trough 7

Trough 3

# Ekman    #/m2

82	3567
22	957
15	653
94	4089
24	1044
114	4959
102	4437
26	1131
32	1392
154	6699





- The flow into the sand facility was diverted into a left and right side.
- Sources at the plant told us that the two sides did not mix.
- We treated the left side (60 MGD Flow) using 264 gallons of VectoBac 12AS. This resulted in approximately 4.4 gl of VectoBac 12AS/MGD.
- Observations were made 24 hours post-exposure.

**Table 2. Post-Treatment Samples**

11/2/2022

**post-treat samples**  
input canal near 29/31  
trough

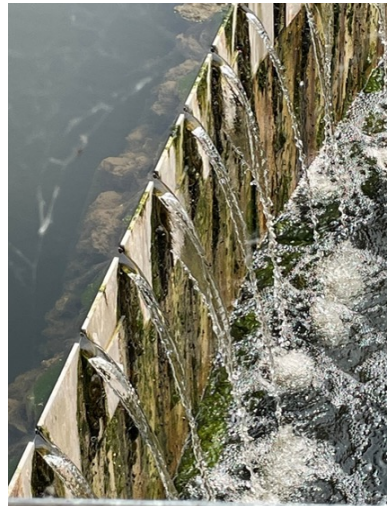
Trough 1  
Trough 3  
Trough 41

# Ekman	#/m2	% Mortality
52	2262	50 - the alive were moribund
7	305	85 (one moribund larvae, the rest dead)
133	5786	97.7 (3 moribund)
80	3480	99 +



# June 2023 Sampling and Application

## Biological Reactors



## Secondary Clarifiers





## Sand Filtration Facility 2023

Multiple Ekman samples taken - too many larvae to count = estimate at over raw # of 500/m<sup>2</sup>

21,750 larvae/m<sup>2</sup>

182,700,000 in Sand Filter Facility



100% Mortality



# Going Forward

- Determine how far an effective concentration will make it through various facilities in the Baltimore plant.
  - Will multiple applications be needed?
- Test various application rates at other WWTPs.
- Provide recommendations for label update.
- Develop a technical use protocol for modern plants with VBC.
- Train sales teams at VBC and Azelis on application protocols.





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# Aerial Bti/Bs Applications in HI

Joe Iburg  
Technical Development Specialist

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# Avian Malaria (*Plasmodium relictum*):

The disease causes birds' red blood cells to rupture, causing low blood oxygen levels. Hawaiian honeycreepers, with no immunity to the disease, rapidly become anemic and lethargic and die.

## The race to protect Hawaii's native forest birds from extinction

Kia'i Moku

COMMUNITY NEWS

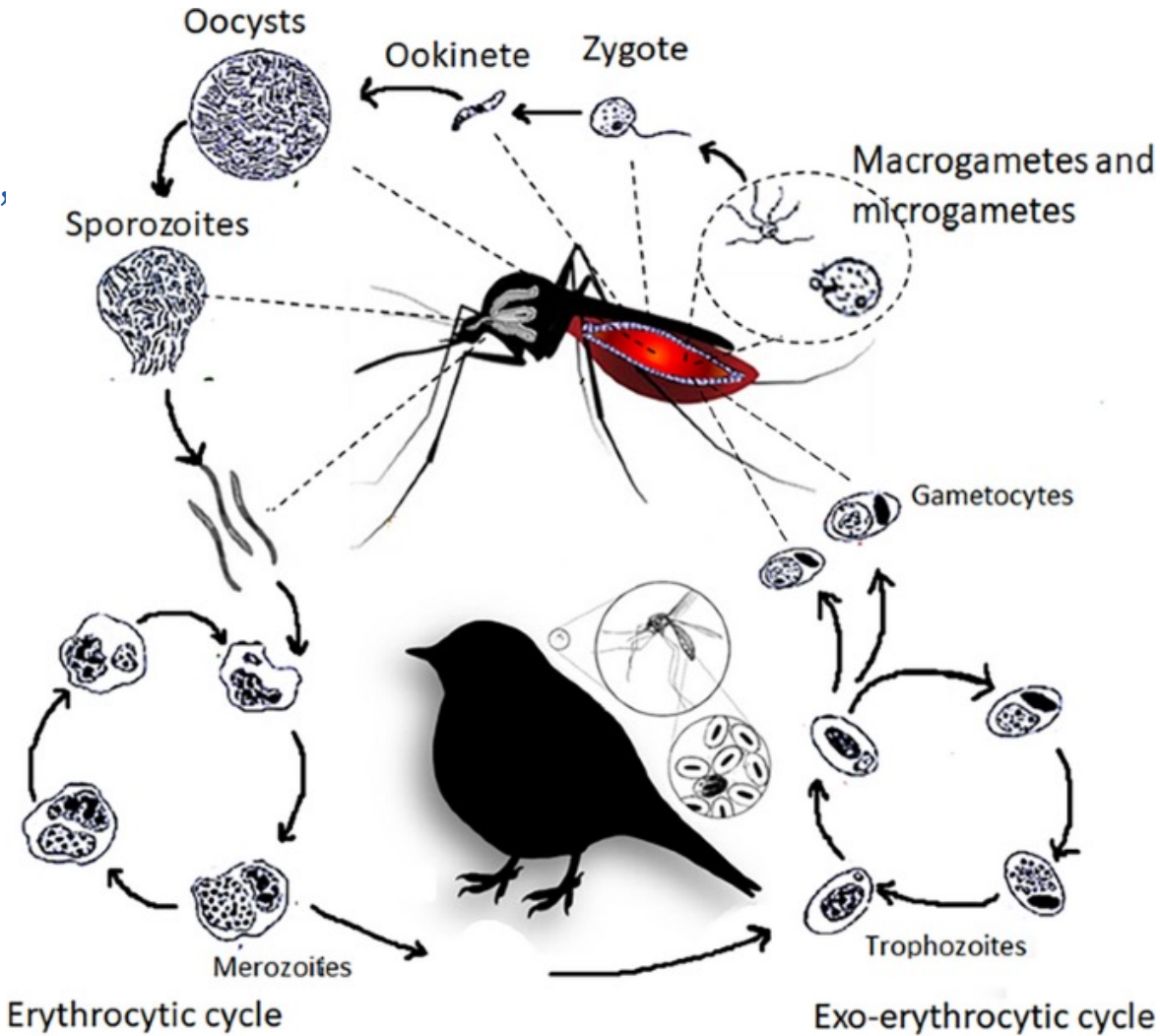
FEB 11, 2023

SERENA FUKUSHIMA  
For The Maui News


f SHARE TWEET



Practice French






 University of Cincinnati

## UC student films documentary on extinction of Hawaiian bird

Filmmaker Ella Marcil spent two weeks this summer documenting the tragic end of an endangered species in her home state of Hawaii.

5 days ago

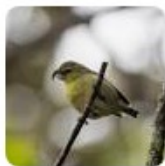



 Department of Land and Natural Resources

## 03/25/23 – ENDANGERED FOREST BIRDS TO RECEIVE PROTECTION FROM AVIAN MALARIA ON MAUI

(HONOLULU) – Friday, the state Board of Land and Natural Resources (BLNR) unanimously approved the Final Environmental Assessment (EA) to...

Mar 25, 2023




 Scientific American

## Millions of Mosquitoes Will Rain Down on Hawaii to Save an Iconic Bird

Millions of mosquitoes dropped from helicopters could be the greatest hope for Hawaii's iconic honeycreepers. At least four species of the...

1 week ago



 The Hill

## Why Hawaii might release millions of mosquitos in Maui

Several of Hawaii's native bird species are at risk of going extinct, in part because of the spread of avian malaria.

Mar 27, 2023




 Civil Beat

## Historic Effort To Save Hawaii Forest Birds With 'Mosquito Birth Control' Hurtles Forward

There are no environmental stumbling blocks in conservationists' ambitious plan to save Hawaii's imperiled honeycreepers by attempting to...

Apr 3, 2023




 DOI.gov

## Department of the Interior Releases Multiagency Strategy for Preventing Imminent Extinction of Hawai'i Forest Birds

The Department of the Interior today announced a multiagency strategy that seeks to prevent imminent extinction of Hawaiian forest birds...

Dec 15, 2022



 Courthouse News Service

## Plan to use bioengineered mosquitoes to save Hawaiian birds draws fire

A Hawaii nonprofit says the state's plan to curb avian malaria hasn't been fully vetted for risks to the environment and other species...

May 9, 2023



 Washington Post

## The race to save a bird from the Maui wildfires – and extinction

With only five left in the wild, a Hawaiian bird called the 'akikiki is the country's most endangered bird, with the Maui fires posing a new...

Aug 21, 2023



 Hawaii News Now

## 'National treasure': Biden administration commits \$16M to Hawaiian bird conservation efforts

Haaland, who is the...

Jun 27, 2023



 Maui Now

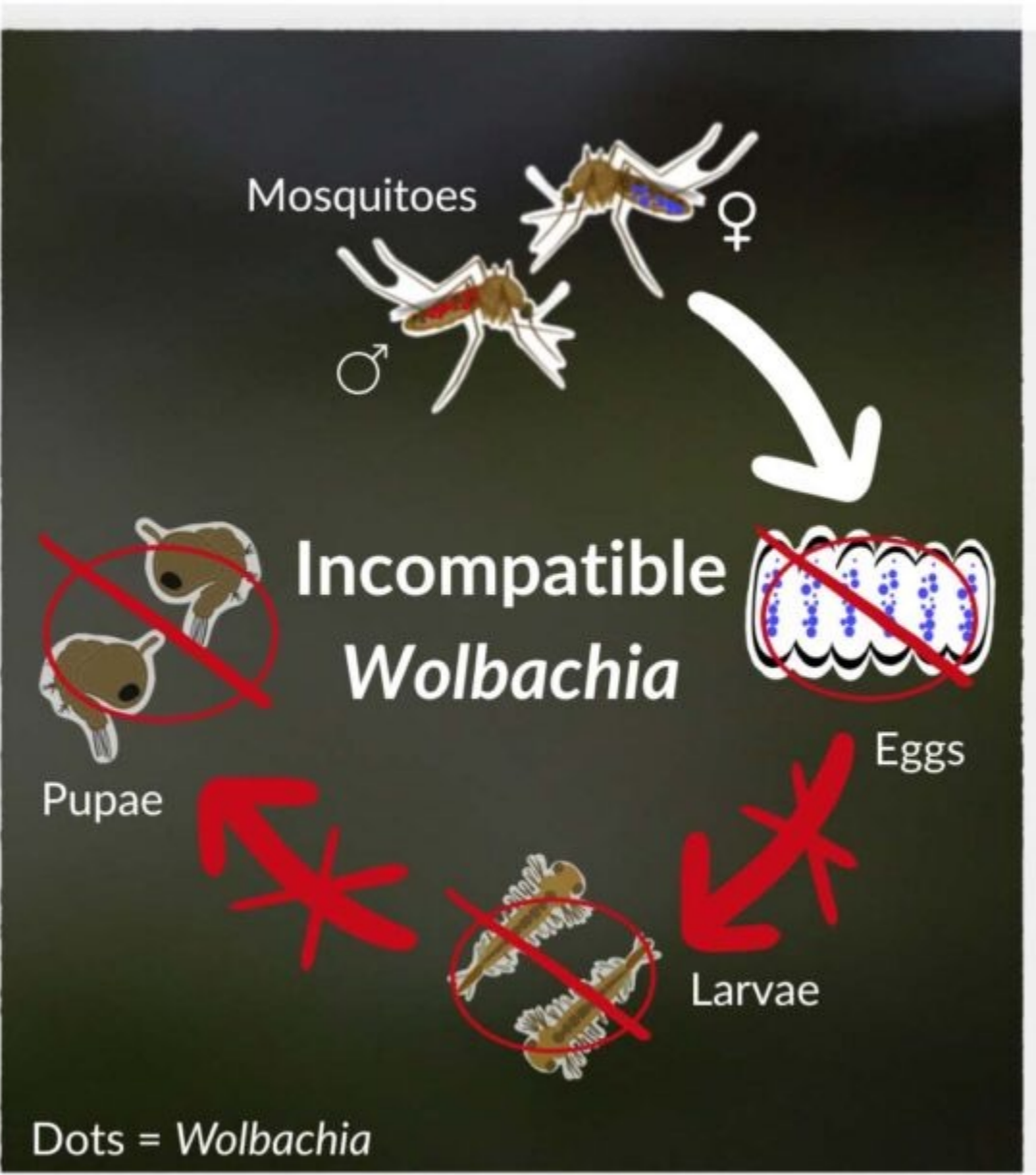
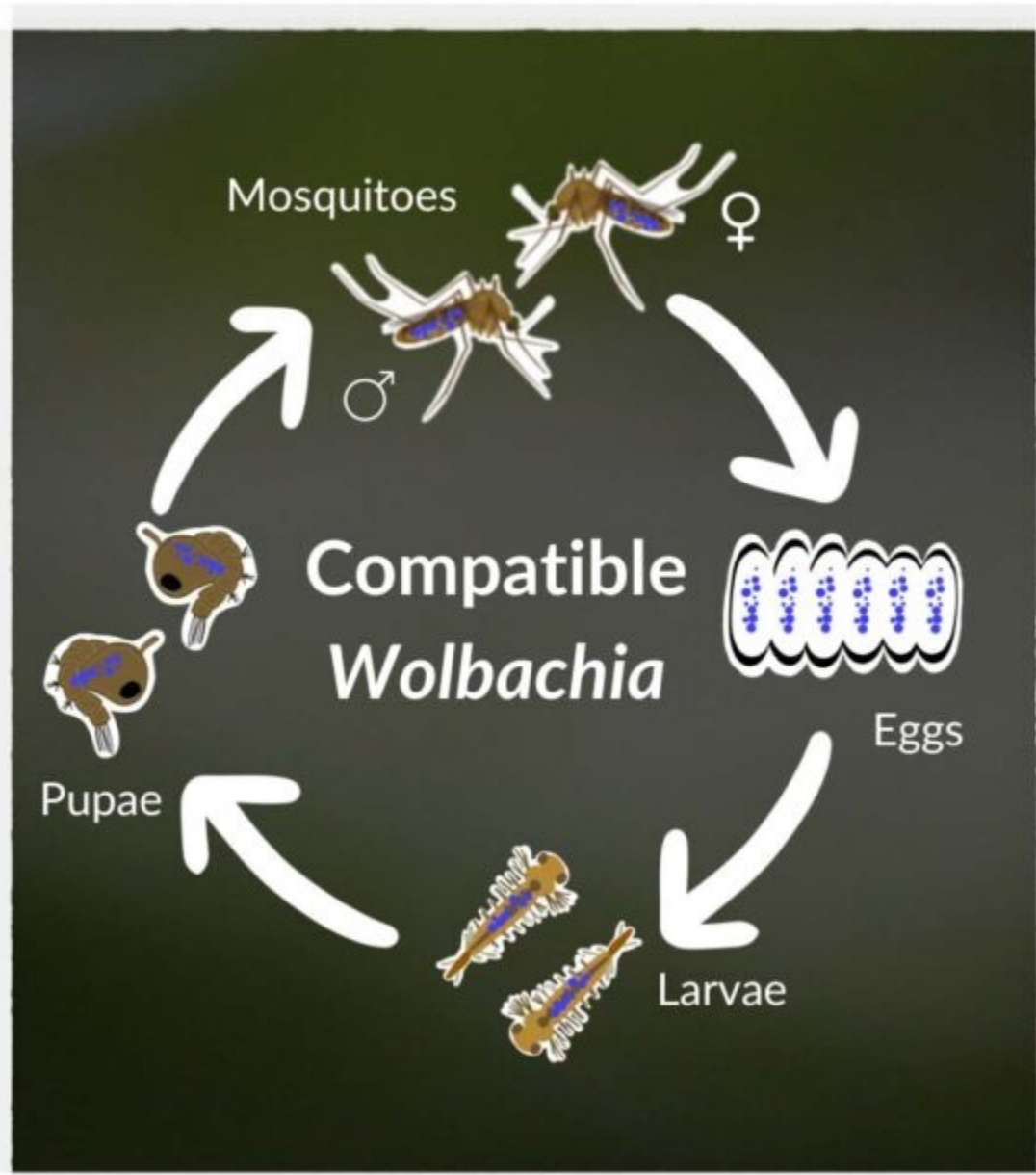
## Hearing begins on planned mosquito release to control avian malaria in effort to save native birds

A hearing got underway Friday on a challenge to the state's planned use of mosquitoes to control avian malaria that is impacting native bird...

Jul 21, 2023









Advancing mosquito suppression techniques targeted *Bti* larvicide application to protect Hawaiian Forest Birds

Hawai'i Department of Lands and Natural Resources, Division of Forestry and Wildlife

Tier 2

Active participant partner: University of Hawai'i-Pacific Cooperative Studies Unit



October 1 2022-September 30, 2024

*Other partners: Garden Island Resource Conservation and Development, Nā Koa Manu Conservation, USFWS, USGS*



*Top left: Kaua'i 'amakihi Lucas Behnke; Top middle: 'apapane, Hannah Landwerlen; Top right: kiwikiu, Zach Pezzillo; Middle left: 'akikiki, Justin Hite; Center: 'i'iwi, Lucas Behnke; Middle right: Maui alauahio, Peter Motyka; Bottom left: 'akeke'e, Hannah Landwerlen; Bottom middle: 'anianiau, Justin Hite; Bottom right: 'ākohekohe, C. Robby Kohley*





Hawai'i SWAP Conservation Actions (Criterion 1)	Benefit addressed by this CSWG (Criterion 7)
Determine the ecological requirements of <i>Culex</i> at mid- and high-elevation forests (DLNR 2015 Chapter 7 fact sheets)	<i>We will investigate the spatial and temporal distribution of Culex larvae and assess the characteristics of larval habitat</i>
Control mosquito populations in fenced and priority conservation areas (DLNR 2015 p 6-5, Chapter 7 fact sheets)	<i>We will develop methods to apply Bti to suppress Culex larvae at larger spatial scales than previously considered</i>
Determine sources of mosquitoes and investigate methods of mosquito control (DLNR 2015 Chapter 7 fact sheets)	<i>We will survey for larval sources and trial a new method of control on Maui and Kaua'i.</i>
Develop and implement programs to obtain, manage, and disseminate information (DLNR 2015, p 4-18, p 6-62)	<i>We will develop programs to share information with partners and agencies about larval ecology and control</i>
Conduct, expand and strengthen public outreach and education (DLNR 2015, p 4-18, p 6-6, and Chapter 7 fact sheets)	<i>We will involve the public in citizen science efforts to survey larvae and assess efficacy of Bti application. We will conduct outreach to explain the need for mosquito control</i>



# Kauai & Maui Forest Bird Recovery Project

- Determine the best product for *Culex quinquefasciatus* in high-elevation rainforest
  - Granular or liquid
  - Bti , Bs, or combination
  - Product Registration
  - Application Rate of a.i.
    - 1.5 pints of VectoBac 12AS/0.5 lb VectoLex WDG per acre
  - Total volume of liquid per acre
    - 1 gl per acre
- In the future we recommend switching to VectoBac WDG





- Determine characteristics of the aircraft
  - MDH369E/MDH369D equipped with Isolair Innovator II liquid application system; side tanks and 10' booms .
  - 46-55 TeeJet nozzles for agricultural applications
- Determine necessary flow rate for each nozzle tip to deliver 1 GPA of mixture

**Flow Rate (GPM) = [Spray Volume (GPA) x Speed (mph) x Swath (ft)] / 495**

Spray Volume - Gallons/Acre (GPA): 1.00

Speed - Miles/Hour (mph): 50

Feet/min: 4400.00

Desired Swath - Feet (ft): 150

Total Flow Rate - Gallons/Minute (GPM): 15.15

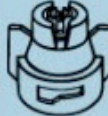


Number of nozzles: 55

Flow Rate per Nozzle: 0.28

Altitude - Feet (ft): 100



- Determine correct nozzle for the aircraft to achieve optimal droplet size
  - Typical WALs application require 30-250 microns
  - TeeJet XRC1103 @ 35 PSI

 	 PSI	DROP SIZE		CAPACITY ONE NOZZLE IN GPM
		80°	110°	
<b>XRC80015</b> (100)	15	M		0.092
	20	M		0.11
	30	F		0.13
	40	F		0.15
	50	F		0.17
	60	F		0.18
<b>XRC8002</b> <b>XRC11002</b> (50)	15	M	M	0.12
	20	M	F	0.14
	30	M	F	0.17
	40	F	F	0.20
	50	F	F	0.22
	60	F	F	0.24
<b>XRC110025</b> (50)	15		M	0.15
	20		M	0.18
	30		F	0.22
	40		F	0.25
	50		F	0.28
	60		F	0.31
<b>XRC8003</b> <b>XRC11003</b> (50)	15	M	M	0.18
	20	M	M	0.21
	30	M	F	0.26
	40	M	F	0.30
	50	M	F	0.34
	60	F	F	0.37



- Build mixing station, go over process
- Calibrate Equipment
  - The total target flow rate to achieve the desired application rate was 15.15 gallons per minute (GPM)
  - Actual: 15.18 GPM of total flow rate





- Droplet Characterization

- Ideally at sunrise during an inversion
- Red Dye mixed with product
- Kromekote cards out 250 ft
- Pilot flies with the wind perpendicular to the cards

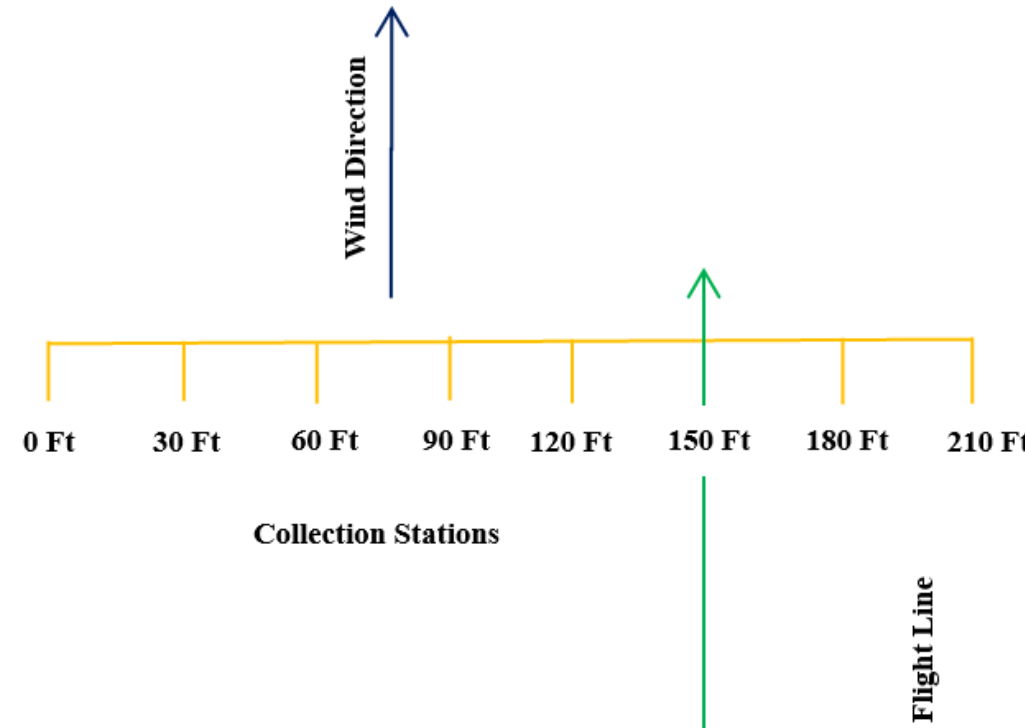




Figure 3. Droplet Density

	File Name	Total Droplets	VMD	NMD	Droplets_per_cm_squared	Card_Location
1	C001.jpg	376	422	105.2245	5.97	0
2	C002.jpg	1254	303	90.81505	19.9	12.5
3	C003.jpg	1403	280	94.65771	22.27	25
4	C004.jpg	1582	378	212.973	25.11	37.5
5	C005.jpg	814	291	82.50881	12.92	50
6	C006.jpg	730	291	94.65771	11.59	62.5
7	C007.jpg	431	285	136.1421	6.84	75
8	C008.jpg	291	210	82.50831	4.62	87.5
9	C009.jpg	164	268	156.1074	2.6	100
10	C010.jpg	92	295	123.2589	1.46	112.5

	File Name	Total Droplets	VMD	NMD	Droplets per cm^2	Card Location
1	C001.jpg	21	87	55.77126	0.33	0
2	C002.jpg	113	430	82.50881	1.79	20
3	C003.jpg	243	329	289.5133	3.86	40
4	C004.jpg	312	298	188.2998	4.95	60
5	C005.jpg	347	337	206.1168	5.51	80
6	C006.jpg	162	412	189.8757	2.57	100
7	C007.jpg	87	358	212.923	1.38	120
8	C008.jpg	74	291	196.0034	1.17	140
9	C009.jpg	16	170	101.8446	0.25	160
10	C010.jpg	5	68	67.88421	0.08	180
11	C011.jpg	14	98	55.77126	0.22	200

Figure 2. Droplet Statistics

	Percent	VMD	NMD
1	DV 0.1	198.9682	39.75327
2	DV 0.5	348.7259	111.6254
3	DV 0.9	480.4444	322.2152

Figure 2. Droplet Statistics

	Percent	VMD	NMD
1	DV 0.1	226.861	55.77126
2	DV 0.5	347.6143	198.9682
3	DV 0.9	445.9009	367.9452





# Bioassay Cups

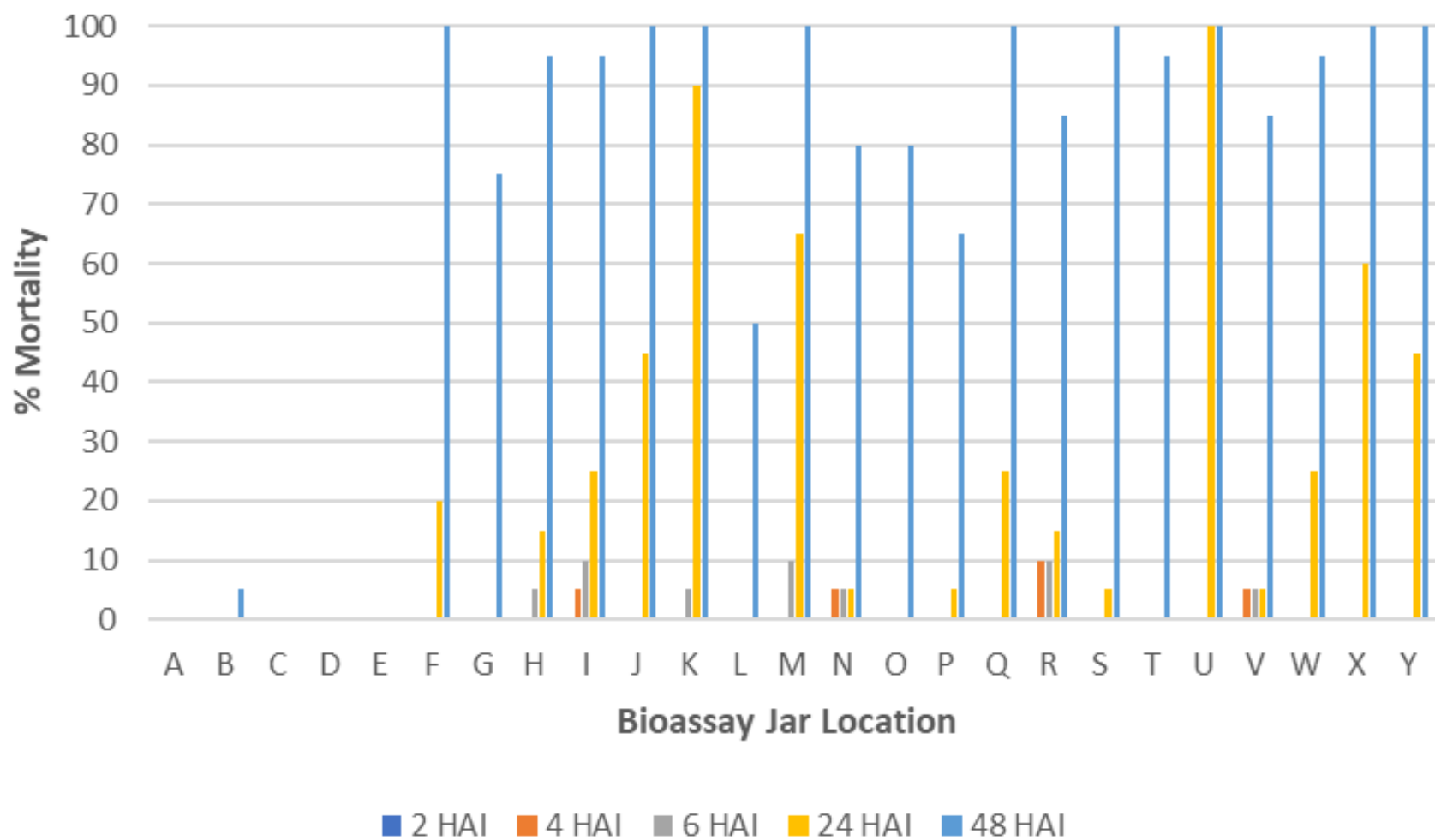
- Cups placed in various locations in spray area prior to application
- 4 micro-habitats chosen- Bog, Creekside, Ginger, Grass
- In each habitat we had 5 covered and 5 uncovered referring to the vegetation immediately over them
- All areas other than bog had about 50% cover





## Percent Mortality per Bioassay Jar

### VectoBac 12-AS & VectoMax WDG - First Infestation



# Thank you



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