



Evaluating a Drone Application of VectoBac FG+ in a Duck Club Pond

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ABSTRACT: Coachella Valley Mosquito & Vector Control District typically uses granular larvicides with 2.8% *Bti*. These products are applied to rural water sources by drone at a rate of 10-15 lbs/acre. We performed a field assay to test VectoBac FG+ (6.075% *Bti*) to see if it would be effective at a lower application rate than other *Bti* granules. This would allow for fewer refills, reducing treatment time and the amount of product needed. Pre- and post-treatment dip counts of wild larvae and floating sentinel cages containing susceptible, lab-reared *Culex tarsalis* larvae were used to evaluate product effectiveness and application technique. The application was made on October 28, 2024.

INTRODUCTION:

From October to February, ponds are flooded for duck hunting in the eastern Coachella Valley. These become excellent habitats for rural mosquitoes like *Culex tarsalis*, a local vector of West Nile Virus. Applying larvicides by drone is faster and safer than technicians treating large ponds on foot every week. Due to the drone's limited carrying capacity and battery life, applying products at lower rates can increase efficiency and reduce cost.

OBJECTIVE:

- Will VectoBac FG+ effectively reduce mosquito larvae when applied to a duck club pond by drone at 5 lbs/acre?



27-gal bin with two floating larval cages



Removing mesh liner from a sentinel cage to count larvae

MATERIALS:

- Drone: Precision Vision 35X by Leading Edge
- 27-gallon bins (open capture area: 3.14 ft²)
- Floating sentinel cages:
 - Modified BioQuip emergence cage bottoms
 - Screened sides
 - Lined with densely-woven polyester mesh
- Insulation foam squares for flotation
- Susceptible 3rd instar *Culex tarsalis* (Bakersfield) larvae – 15 per sentinel cage
- Mosquito dipper to collect wild larvae



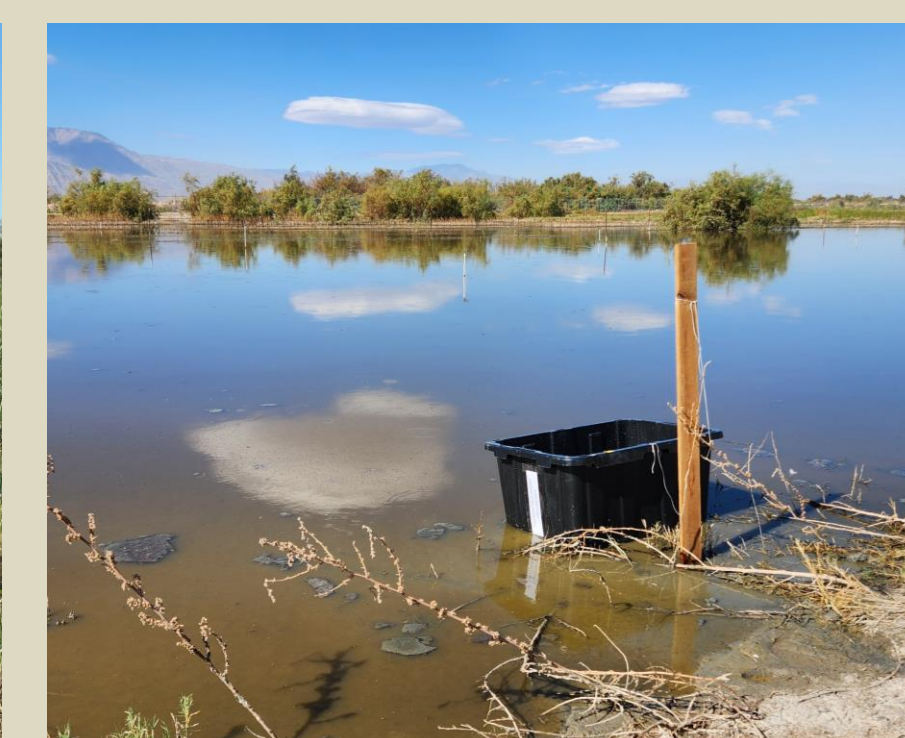
Larval sentinel cage

METHODS:

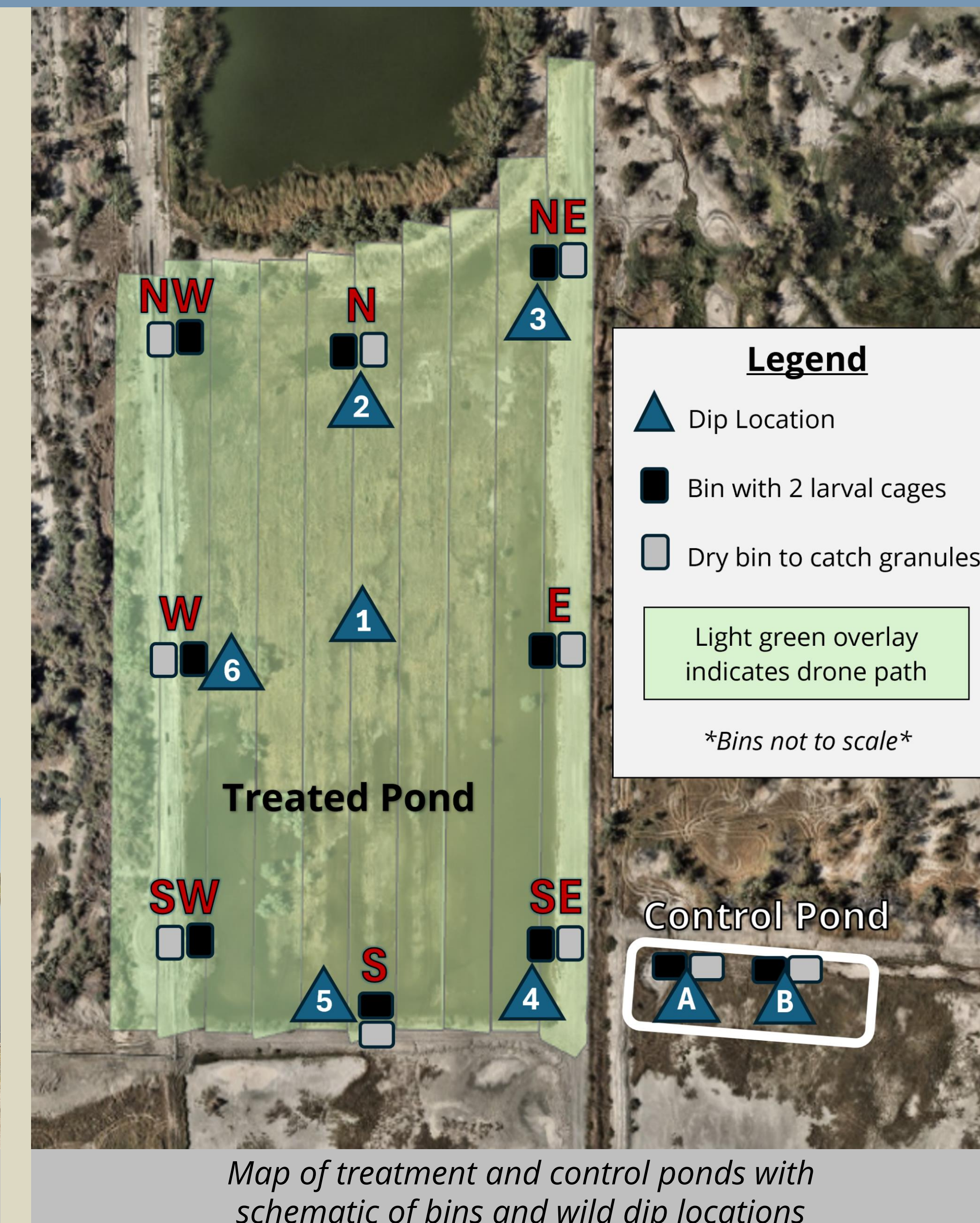
- Pairs of bins were set around pond perimeter; one dry and one holding pond water with 2 floating larval cages.
- Obtained pre-treatment dip counts of wild larvae. (10 dips per location)
- Applied VectoBac FG+ at 5 lbs/acre.
 - Drone altitude: 40 ft, swath: 40 ft
- Weighed granules captured in dry bins.
- Obtained 24-hr post-treatment dip counts and mortality of lab-reared larvae in sentinel cages.



Sampling wild larvae at Dip Location 1



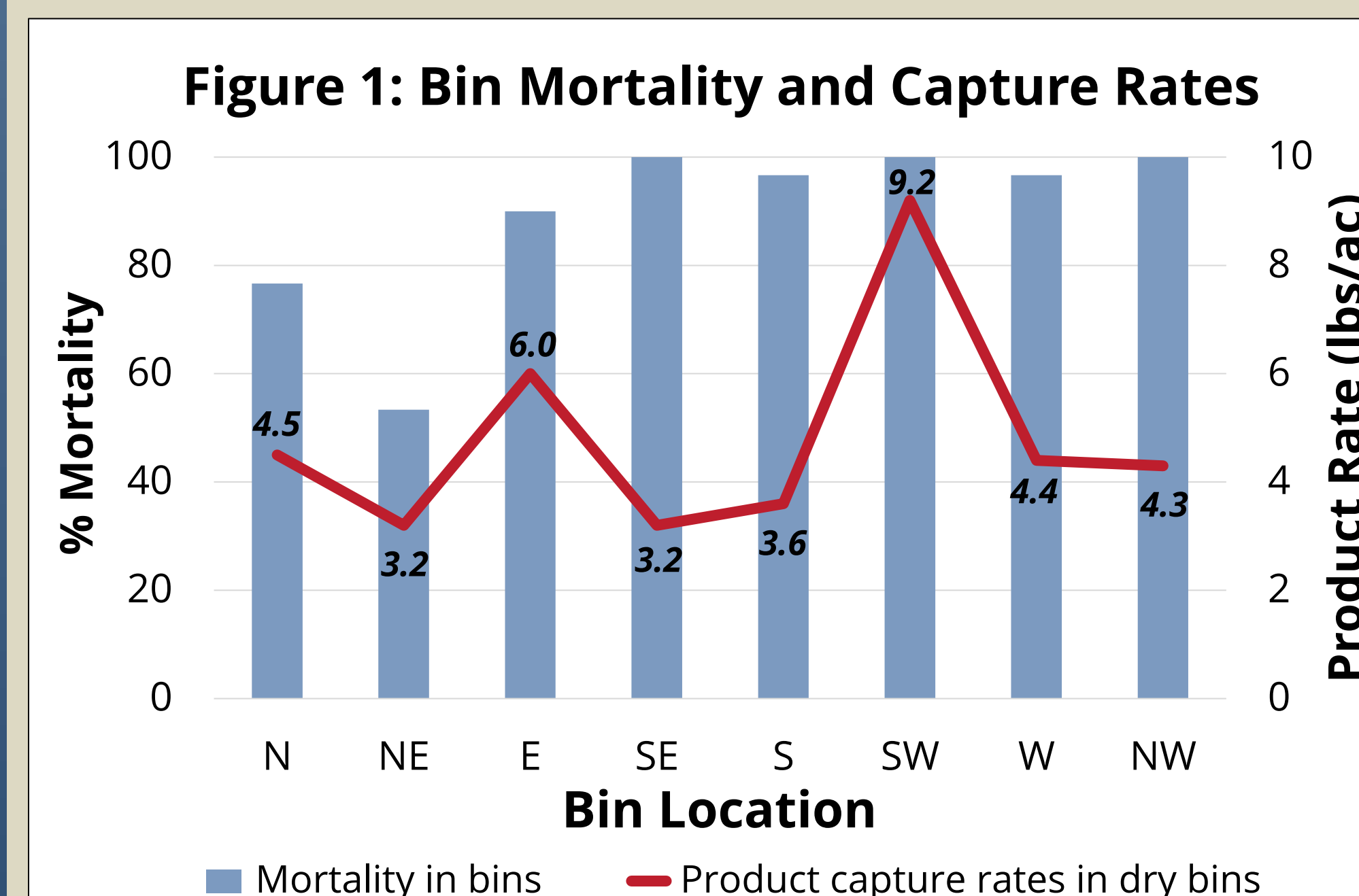
Bin holding sentinel cages staked inside pond



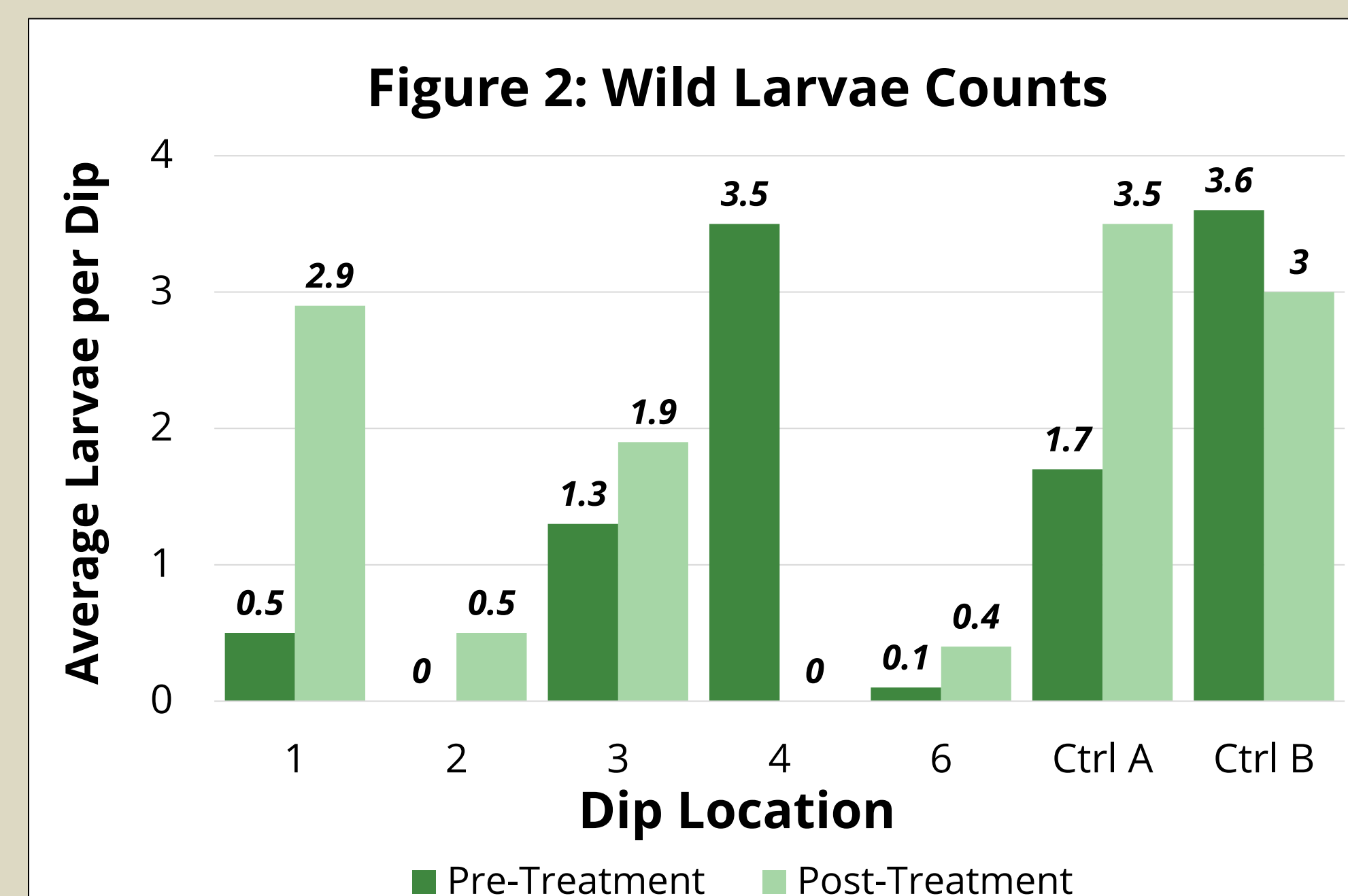
Map of treatment and control ponds with schematic of bins and wild dip locations

RESULTS:

- An isolated pool of water near the SE corner of the pond had the heaviest breeding before treatment (35 larvae/dip) and had no breeding after treatment.



- Figure 1:** All bins in the treatment area captured granules, resulting in high mortality of lab-reared larvae. One sentinel cage in the NE bin did not catch granules, causing lower mortality. Untreated control bins had 95% survival. Granule capture rates in dry bins ranged from 3.2 - 9.2 lbs/ac (average 4.8 lbs/acre).
- Figure 2:** Wild larvae were not reduced after treatment, except at dip location 4 which included the isolated pool. Location 5 had no larvae before or after treatment.



CONCLUSIONS:

- Based on the product captured in dry bins, the drone applied granules at the desired rate.
- VectoBac FG+ killed the lab-reared larvae in sentinel cages. Our novel method of placing larval cages in 27-gal bins worked well and will be used again for future field trials.
- This application did not reduce wild mosquito larvae in the pond as expected; however, breeding was scant before and after treatment and limited to densely vegetated areas, making it difficult to assess.
- VectoBac FG+ must land near mosquito larvae to be effective. We confirmed this by showing high mortality in sentinel cages where granules landed directly, and low mortality in a cage that did not capture any granules.



Areas in pond where wild larvae were found

- We saw 100% mortality of wild mosquito larvae in the isolated pool of water which had no vegetation or debris. VectoBac FG+ may be effective at a low rate in smaller water sources that contain fewer obstructions from plants and debris.



Isolated pool where treatment was effective

ACKNOWLEDGEMENTS:

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