

Navel Orangeworm Program 2023 – Weekly Report

Week Ending – April 21, 2023

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I. Program Updates

Navel Orangeworm Area Wide Program – Multi-Phase Approach

Phase 1 – 2018-2022

Phase 1 was the Initial Phase of the Navel Orangeworm (NOW) Program (Program) with a focus on developing NOW sterile insect technique (SIT) moths, determining their viability during cold storage transfer, performing quality control (QC) on mating propensity and survivability of the sterile moths, developing a trap monitoring program, and collecting preliminary damage data from the orchards participating in the Program's project site.

Phase 2 – 2023

Phase 2 is the Data Phase of the NOW Program. The focus of this phase is controlling variables within the orchards participating in the Program's project site in order to increase the integrity of the field data being collected. During this phase a University of California Cooperative Extension (UCCE) coordinator will take over as a grower point of contact. They will be responsible for coordinating with growers and establishing orchards for the Phase 2 Program project site.

Navel Orangeworm Sterile Insect Technique

The Navel Orangeworm Program utilizes NOW SIT moths obtained from the United States Department of Agriculture (USDA) Phoenix, Arizona Rearing Facility. QC tests are performed on every shipment of NOW SIT moths used for aerial releases.

Aerial releases for 2023 began on Sunday, March 12, with one magazine of approximately 750,000 moths being released daily over two 640-acre orchards in Fresno County, designated as Zones 1 and 3. Beginning on Thursday, April 13, a second magazine of approximately 750,000 moths began being released daily over a single 640-acre orchard, designated as Zone 6. During the period of April 18 to April 23, the second magazine was released daily over two 640-acre orchards, designated as Zones 6 and 7. As of Monday, April 24, the second magazine began being released daily over two 640-acre orchards, designated as Zones 4 and 6.

Listed below are any circumstances which prevented regular releases in 2023:

March 10: No release conducted due to excessive rain preventing access to release sites via air or ground; moth shipment from March 9 held overnight for a second night for potential release on March 11

March 11: No release conducted due to excessive rain preventing access to release sites via air or ground; moth shipment from March 9 was destroyed; moth shipment from March 10 held overnight for a second night for potential release on March 12

March 12: Double release conducted over Zones 1 and 3 with moth shipments from March 10 and 11

March 14: No release conducted due to excessive rain preventing access to release sites via air or ground; moth shipment from March 13 held overnight for a second night for potential release on March 15

March 15: Double release conducted over Zones 1 and 3 with moth shipments from March 13 and 14

March 17: No release conducted due to mechanical issues with release aircraft; moth shipment from March 16 held overnight for a second night for potential release on March 18

March 18: Double release conducted over Zones 1 and 3 with moth shipments from March 16 and 17

April 20: First magazine unintentionally released over Zones 1 and 7 instead of Zones 1 and 3; the second magazine released, per schedule, over Zones 6 and 7

Navel Orangeworm Trapping

During Phase 1 of the NOW Program, trap monitoring operations began May 5, 2020, with an area wide project site that included a total of four orchards in Fresno County: two 640-acre almond orchards and two 640-acre pistachio orchards. On May 17, 2021, the Area Wide Project site expanded to include four additional orchards in Fresno County: one 640-acre almond orchard, one 640-acre pistachio orchard, one 160-acre almond orchard, and one 160-acre pistachio orchard. All eight orchards, designated as Zones 1 through 8, were serviced on a weekly basis.

For Phase 2 of the NOW Program, the area wide project site will include eight 640-acre orchards; four pistachio and four almond. Currently, the project site includes seven orchards in Fresno County: four 640-acre pistachio orchards and three 640-acre almond orchards. All seven orchards, designated as Zones 1 through 7, are serviced on a weekly basis. More acreage will be added to the Project site before being finalized. As more acreage is added, it will be included in this weekly report.

Listed below are any circumstances which prevented regular trap servicing in 2023:

- Week of March 3: No traps were serviced due to excessive rain preventing access to trap sites
- Week of March 17: Only Zone 1 traps were serviced; Zones 2 - 6 traps not serviced due to excessive rain preventing access to trap sites
- Week of March 24: Only Zone 1 traps were serviced; Zones 2 - 6 traps not serviced due to excessive rain preventing access to trap sites
- Week of March 31: No traps were serviced in Zone 2 due to excessively muddy conditions preventing access to trap sites; trap sites 26 – 36 in Zone 4 were not serviced due to pesticide applications on site

II. Project Design

The 2023 Area Wide Project site is being restructured in preparation for Phase 2 of the Program, which will establish more standardized and consistent approaches to mating disruption, sanitation, pesticide usage, and other cultural practices for more comparable data between each orchard set (release site/control site).

Listed below is information related to each orchard within the Program’s Phase 2 project site for 2023, thus far:

Zone #	Crop Type	Acres	Release/Non-release Site	Date Added to Area Wide Project
Zone 1	Pistachio	640	Release	February 2023
Zone 2	Pistachio	640	Non-release	February 2023
Zone 3	Almond	640	Release	February 2023
Zone 4	Almond	640	Release	February 2023
Zone 5	Pistachio	640	Non-release	March 2023
Zone 6	Pistachio	640	Release	March 2023
Zone 7	Almond	640	Non-release	April 2023

Each zone has a trap site ratio of approximately 1 trap site per 18 acres for a total of 36 trap sites for each 640-

acre zone. Each trap site has one trap baited with NOW pheromone/PPO lures. Traps baited with pistachio meal bait are planned to be deployed in all zones. All traps are serviced on a weekly basis. Servicing includes collecting trap bottoms and replacing with new trap bottoms. Bait/lure changes occur once a month, and trap tops are replaced as needed. Counts are performed on each trap collected to determine number of wild versus sterile captures and male versus female captures.

III. Trap Results for Week Ending on April 21, 2023

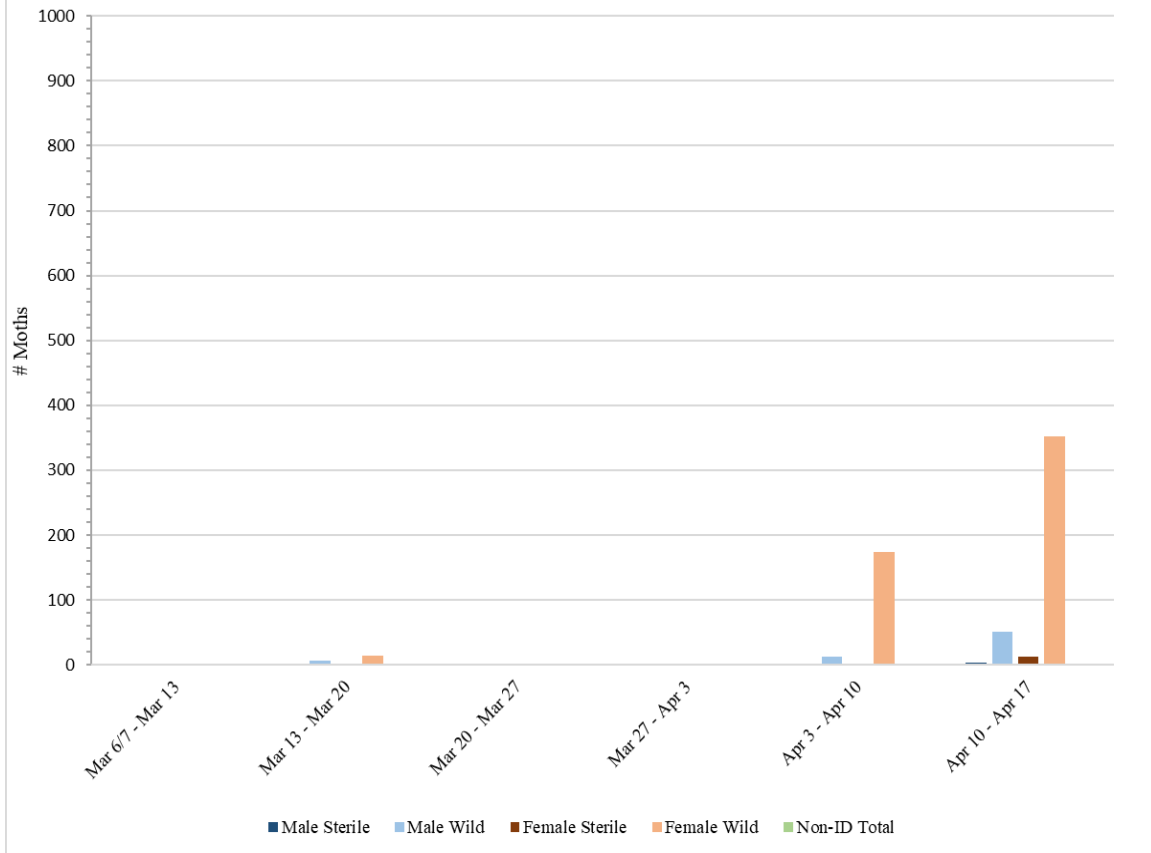
Zone 1 – Pistachio Orchard

A total of **36** meal-baited traps and **36** pheromone/PPO lure-baited traps were collected from Zone 1 on Monday, April 17.

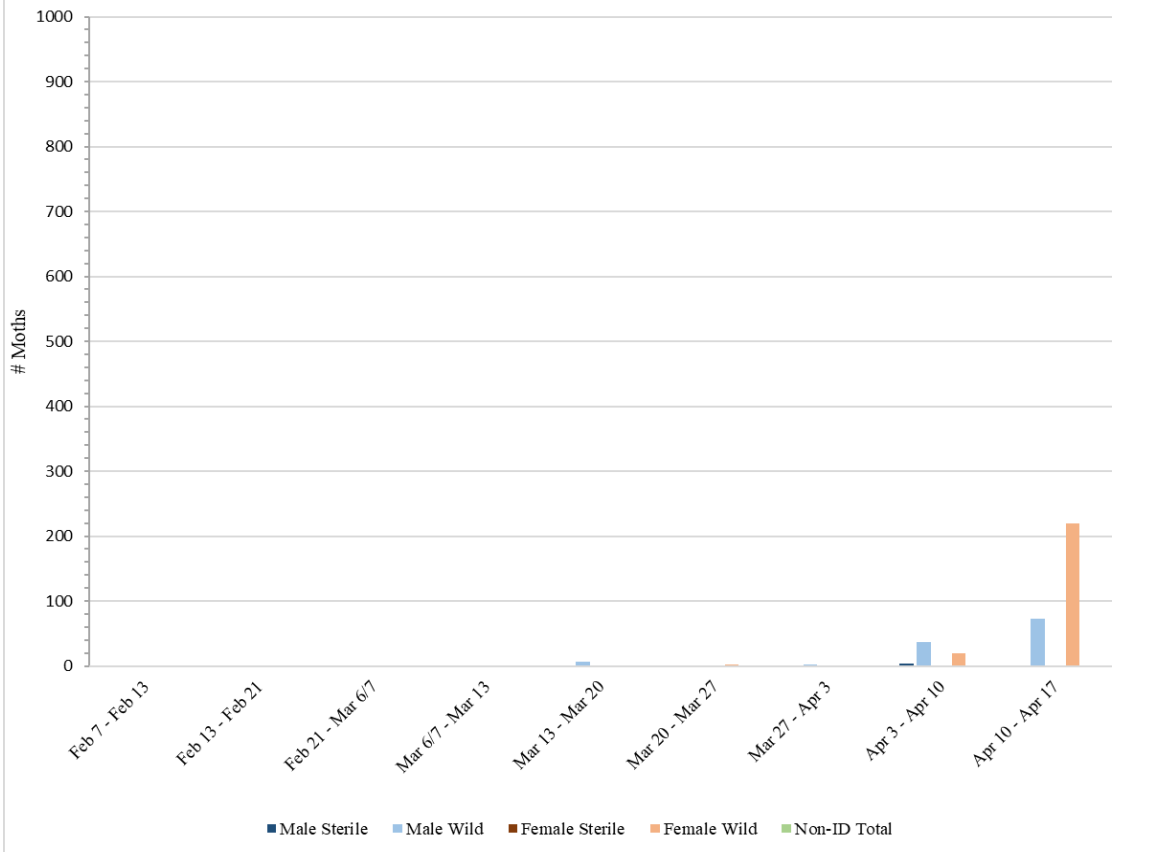
Zone 1 – Pistachio								
Meal Baited Traps								
Dates Traps in Field	# of Releases During Trap Period	Male Sterile	Male Wild	Male Total	Female Sterile	Female Wild	Female Total	Non-ID Total
² Mar 6/7 – Mar 13	2	0	0	0	1	1	2	0
Mar 13 – Mar 20	8	0	6	6	0	14	14	0
Mar 20 – Mar 27	8	0	0	0	1	0	1	0
Mar 27 – Apr 3	8	0	1	1	0	0	0	0
Apr 3 – Apr 10	8	0	13	13	0	174	174	0
Apr 10 – Apr 17	8	3	51	54	12	352	364	1
² Traps 1-18 placed on Mar 6; Traps 19-36 placed on Mar 7								

Zone 1 – Pistachio								
Pheromone/PPO Lure Baited Traps								
Dates Traps in Field	# of Releases During Trap Period	Male Sterile	Male Wild	Male Total	Female Sterile	Female Wild	Female Total	Non-ID Total
Feb 7 - Feb 13	0	0	0	0	0	0	0	0
Feb 13 – Feb 21	0	0	0	0	0	0	0	0
¹ Feb 21 – Mar 6/7	0	0	0	0	0	0	0	0
² Mar 6/7 – Mar 13	2	0	0	0	1	0	1	0
Mar 13 – Mar 20	8	0	7	7	1	1	2	0
Mar 20 – Mar 27	8	0	1	1	0	2	2	0
Mar 27 – Apr 3	8	0	2	2	0	0	0	0
Apr 3 – Apr 10	8	3	37	40	0	19	19	0
Apr 10 – Apr 17	8	0	72	72	0	220	220	0
¹ No traps were serviced in Zone 1 during the week of Mar 3 due to excessive rain preventing access								
² Traps 1-18 serviced on Mar 6; Traps 19-36 serviced on Mar 7								

Zone 1 - Pistachio Orchard - Meal Baited Traps



Zone 1 - Pistachio Orchard - Pheromone/PPO Baited Traps



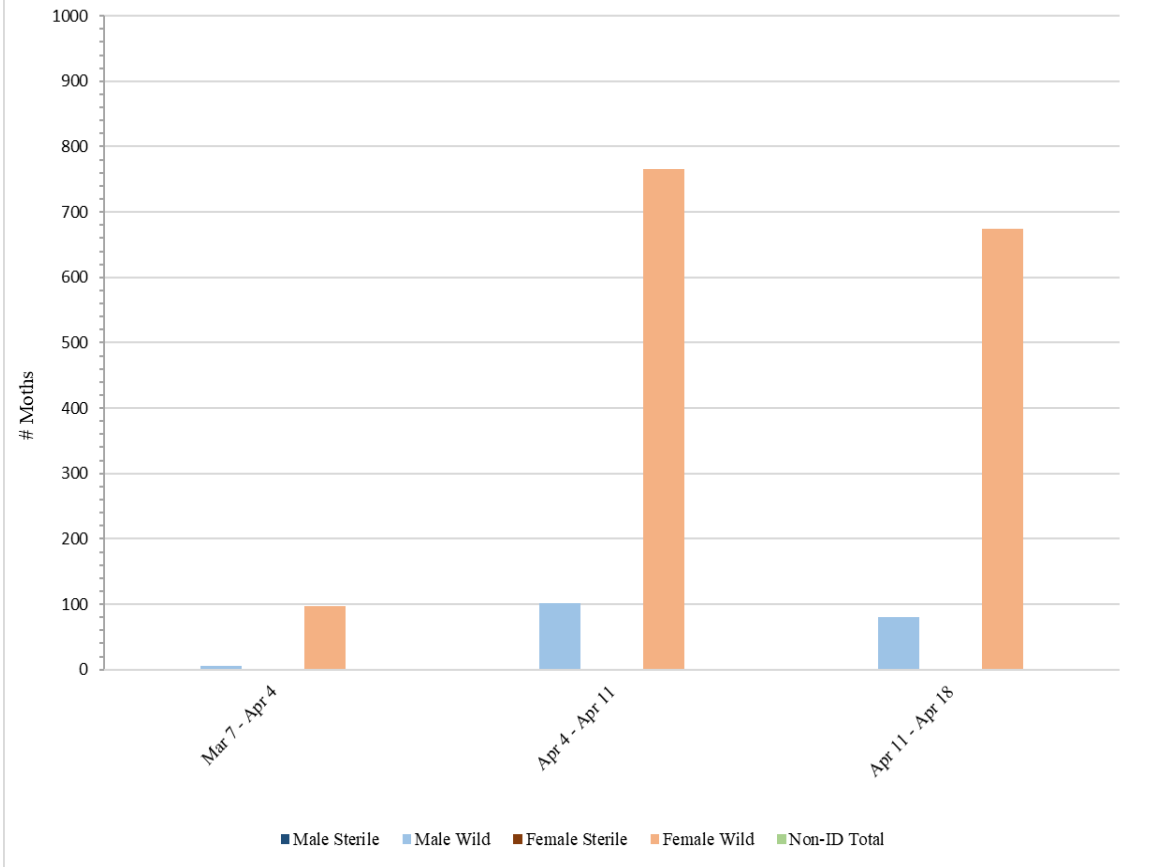
Zone 2 – Pistachio Orchard

A total of **36** meal-baited traps and **35** pheromone/PPO lure-baited traps were collected from Zone 2 on Tuesday, April 18. Trap number 21 pheromone was missing during this week.

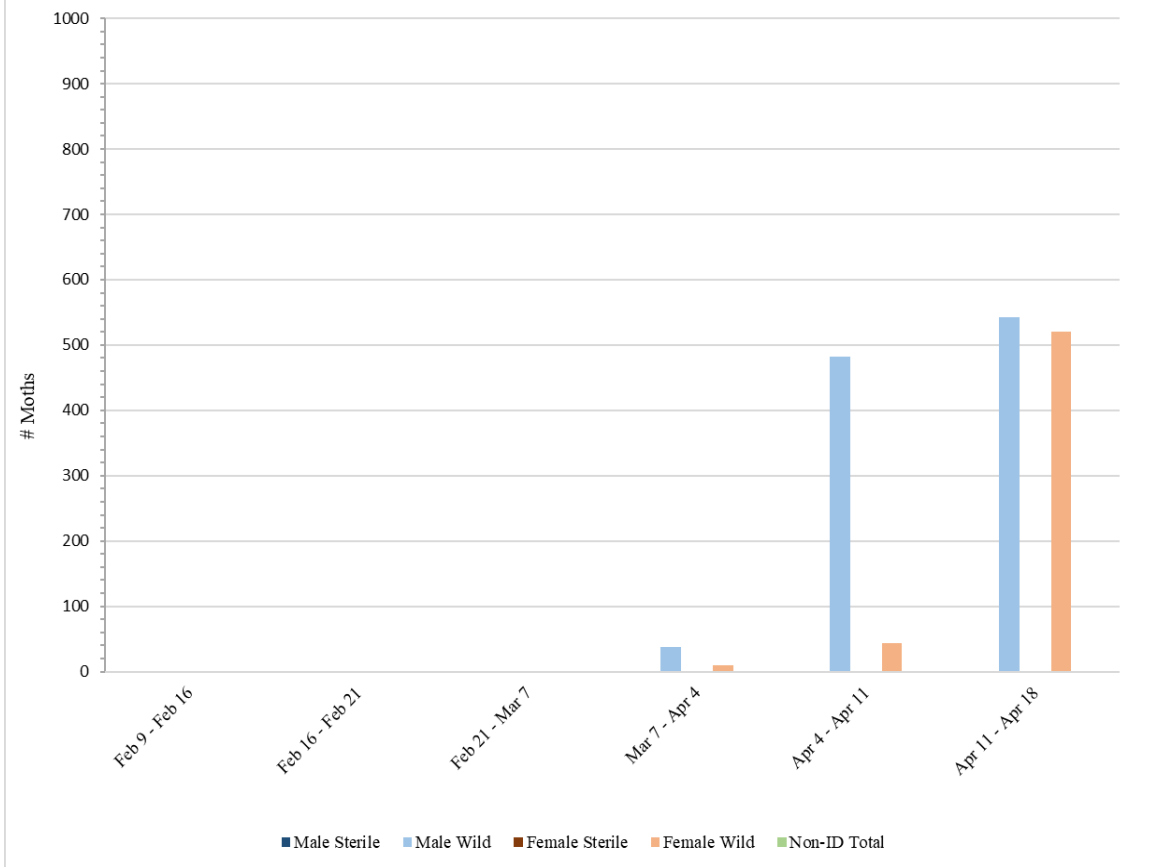
Zone 2 - Pistachio								
Meal Baited Traps								
Dates Traps in Field	# of Releases During Trap Period	Male Sterile	Male Wild	Male Total	Female Sterile	Female Wild	Female Total	Non-ID Total
² Mar 7 – Apr 4	0	0	6	6	0	97	97	0
Apr 4 – Apr 11	0	0	102	102	0	765	765	0
Apr 11 – Apr 18	0	0	81	81	0	674	674	0
² No traps were serviced in Zone 2 during the weeks of Mar 17, Mar 24, and Mar 31 due to excessive rain and muddy conditions preventing access								

Zone 2 - Pistachio								
Pheromone/PPO Lure Baited Traps								
Dates Traps in Field	# of Releases During Trap Period	Male Sterile	Male Wild	Male Total	Female Sterile	Female Wild	Female Total	Non-ID Total
Feb 9 - Feb 16	0	0	0	0	0	0	0	0
Feb 16 – Feb 21	0	0	0	0	0	0	0	0
¹ Feb 21 – Mar 7	0	0	0	0	0	0	0	0
² Mar 7 – Apr 4	0	0	38	38	0	9	9	0
Apr 4 – Apr 11	0	0	482	482	0	44	44	0
Apr 11 – Apr 18	0	0	542	542	0	521	521	0
¹ No traps were serviced in Zone 2 during the week of Mar 3 due to excessive rain preventing access								
² No traps were serviced in Zone 2 during the weeks of Mar 17, Mar 24, and Mar 31 due to excessive rain and muddy conditions preventing access								

Zone 2 - Pistachio Orchard - Meal Baited Traps



Zone 2 - Pistachio Orchard - Pheromone/PPO Baited Traps



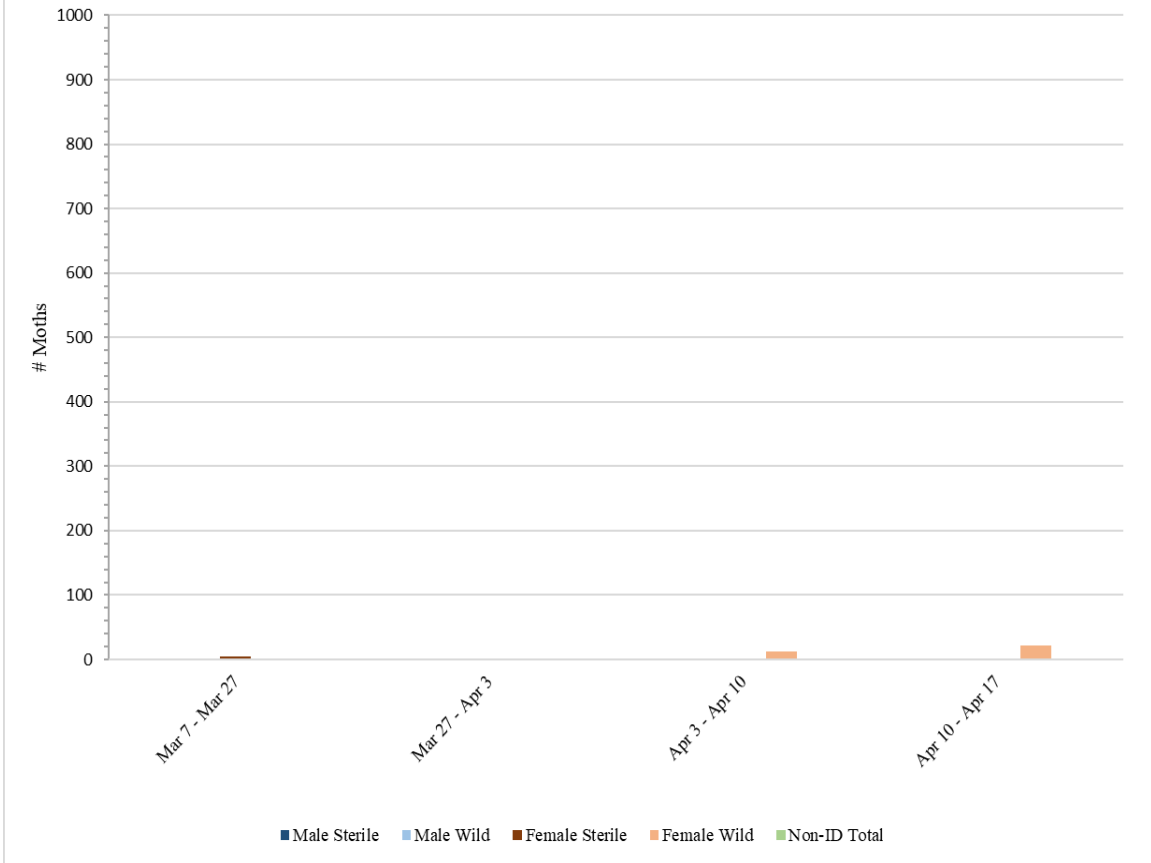
Zone 3 – Almond Orchard

A total of **36** meal-baited traps and **36** pheromone/PPO lure-baited traps were collected from Zone 3 on Monday, April 17.

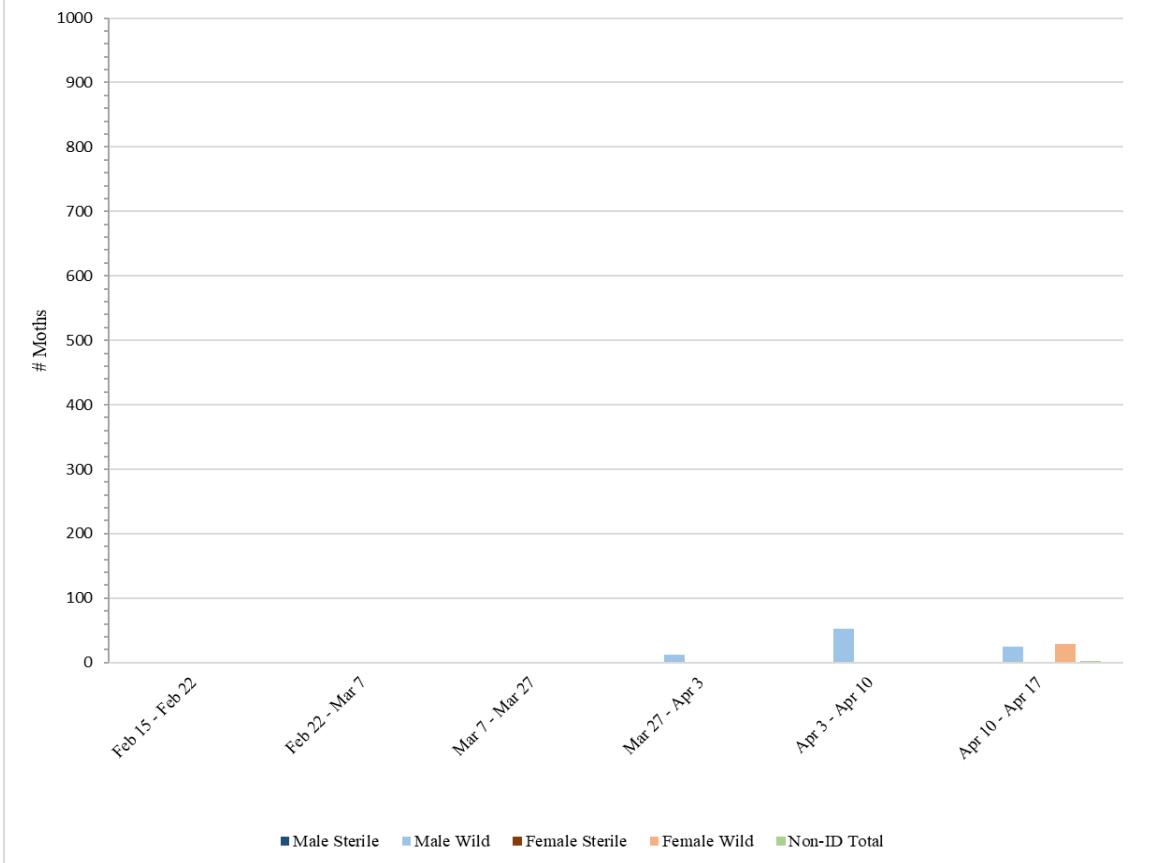
Zone 3 - Almond								
Meal Baited Traps								
Dates Traps in Field	# of Releases During Trap Period	Male Sterile	Male Wild	Male Total	Female Sterile	Female Wild	Female Total	*Non-ID Total
² Mar 7 – Mar 27	17	0	0	0	4	0	4	0
Mar 27 – Apr 3	8	0	0	0	0	1	1	0
Apr 3 – Apr 10	8	0	0	0	0	13	13	0
Apr 10 – Apr 17	8	0	0	0	0	22	22	0
² No traps were serviced in Zone 3 during the weeks of Mar 17 and Mar 24 due to excessive rain preventing access								

Zone 3 - Almond								
Pheromone/PPO Lure Baited Traps								
Dates Traps in Field	# of Releases During Trap Period	Male Sterile	Male Wild	Male Total	Female Sterile	Female Wild	Female Total	*Non-ID Total
Feb 15 - Feb 22	0	0	0	0	0	0	0	0
¹ Feb 22 – Mar 7	0	0	0	0	0	0	0	0
² Mar 7 – Mar 27	17	1	1	2	0	0	0	0
Mar 27 – Apr 3	8	0	12	12	0	0	0	0
Apr 3 – Apr 10	8	1	53	54	0	1	1	0
Apr 10 – Apr 17	8	1	25	26	1	29	30	3
¹ No traps were serviced in Zone 3 during the week of Mar 3 due to excessive rain preventing access								
¹ No traps were serviced in Zone 3 during the weeks of Mar 17 and Mar 24 due to excessive rain preventing access								

Zone 3 - Almond Orchard - Meal Baited Traps



Zone 3 - Almond Orchard - Pheromone/PPO Baited Traps



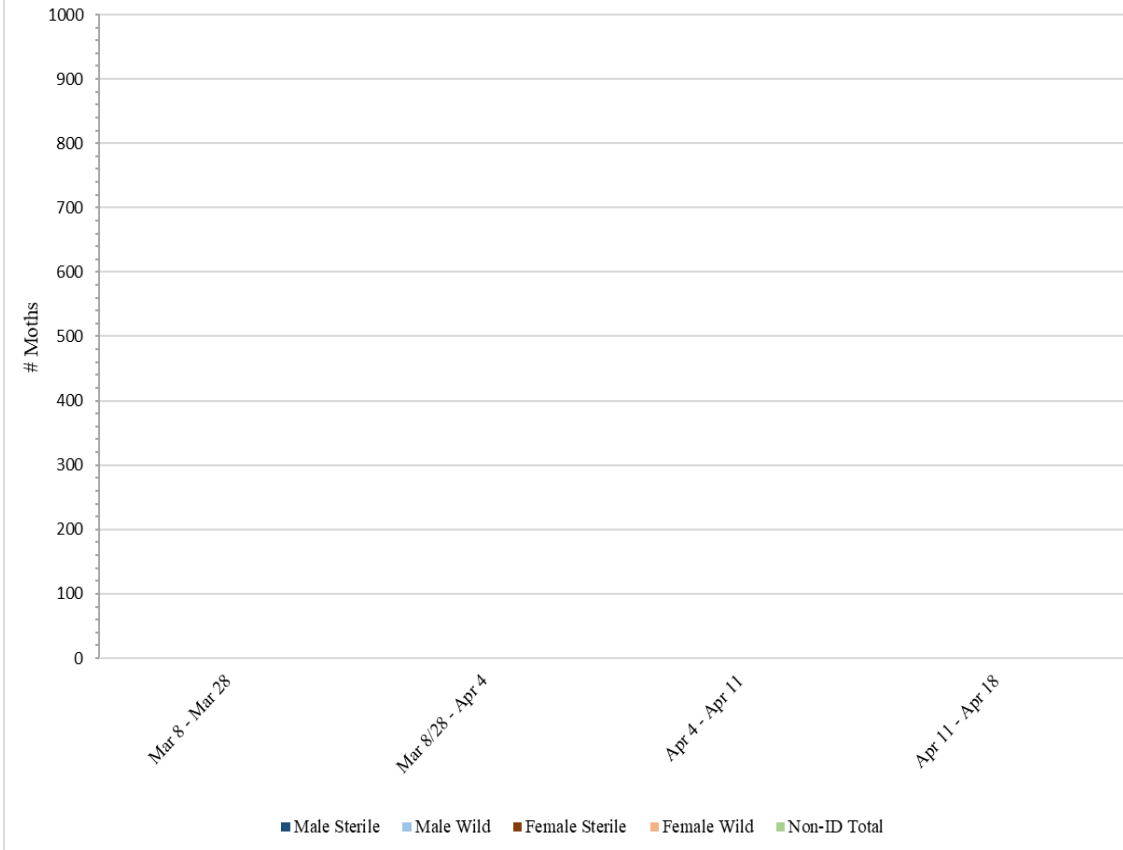
Zone 4 – Almond Orchard

A total of **36** meal-baited traps and **36** pheromone/PPO lure-baited traps were collected from Zone 4 on Tuesday, April 18.

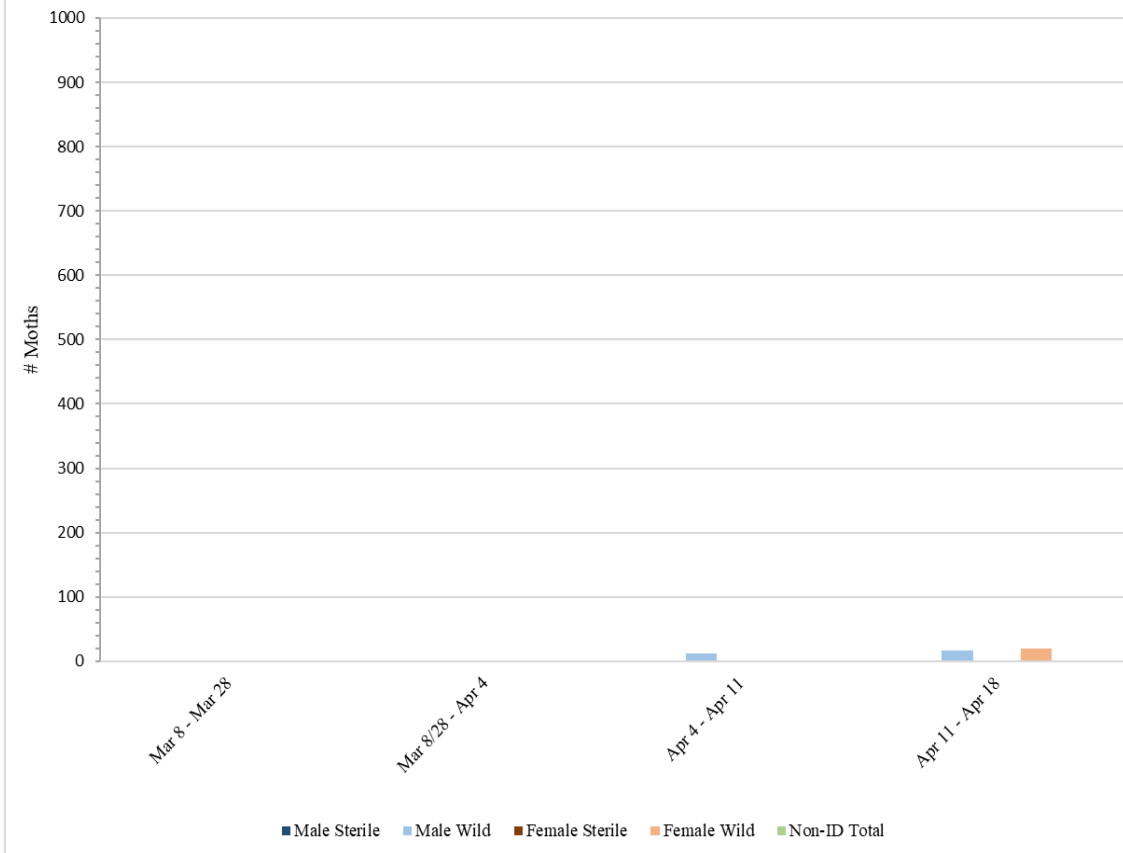
Zone 4 - Almond								
Meal Baited Traps								
Dates Traps in Field	# of Releases During Trap Period	Male Sterile	Male Wild	Male Total	Female Sterile	Female Wild	Female Total	Non-ID Total
¹ Mar 8 – Mar 28	0	0	0	0	0	0	0	0
² Mar 8/28 – Apr 4	0	0	0	0	0	0	0	0
Apr 4 – Apr 11	0	0	0	0	0	0	0	0
Apr 11 – Apr 18	0	0	1	1	0	2	2	0
¹ No traps were serviced in Zone 4 during the weeks of Mar 17 and Mar 24 due to excessive rain preventing access; traps 26 – 36 not serviced in Zone 4 during the week of Mar 31 due to pesticide applications on site ² Traps 26 – 36 in field since Mar 8								

Zone 4 - Almond								
Pheromone/PPO Lure Baited Traps								
Dates Traps in Field	# of Releases During Trap Period	Male Sterile	Male Wild	Male Total	Female Sterile	Female Wild	Female Total	Non-ID Total
¹ Mar 8 – Mar 28	0	0	0	0	0	0	0	0
² Mar 8/28 – Apr 4	0	0	1	1	0	0	0	0
Apr 4 – Apr 11	0	0	12	12	0	0	0	0
Apr 11 – Apr 18	0	0	16	16	0	20	20	0
¹ No traps were serviced in Zone 4 during the weeks of Mar 17 and Mar 24 due to excessive rain preventing access; traps 26 – 36 not serviced in Zone 4 during the week of Mar 31 due to pesticide applications on site ² Traps 26 – 36 in field since Mar 8								

Zone 4 - Almond Orchard - Meal Baited Traps



Zone 4 - Almond Orchard - Pheromone/PPO Baited Traps

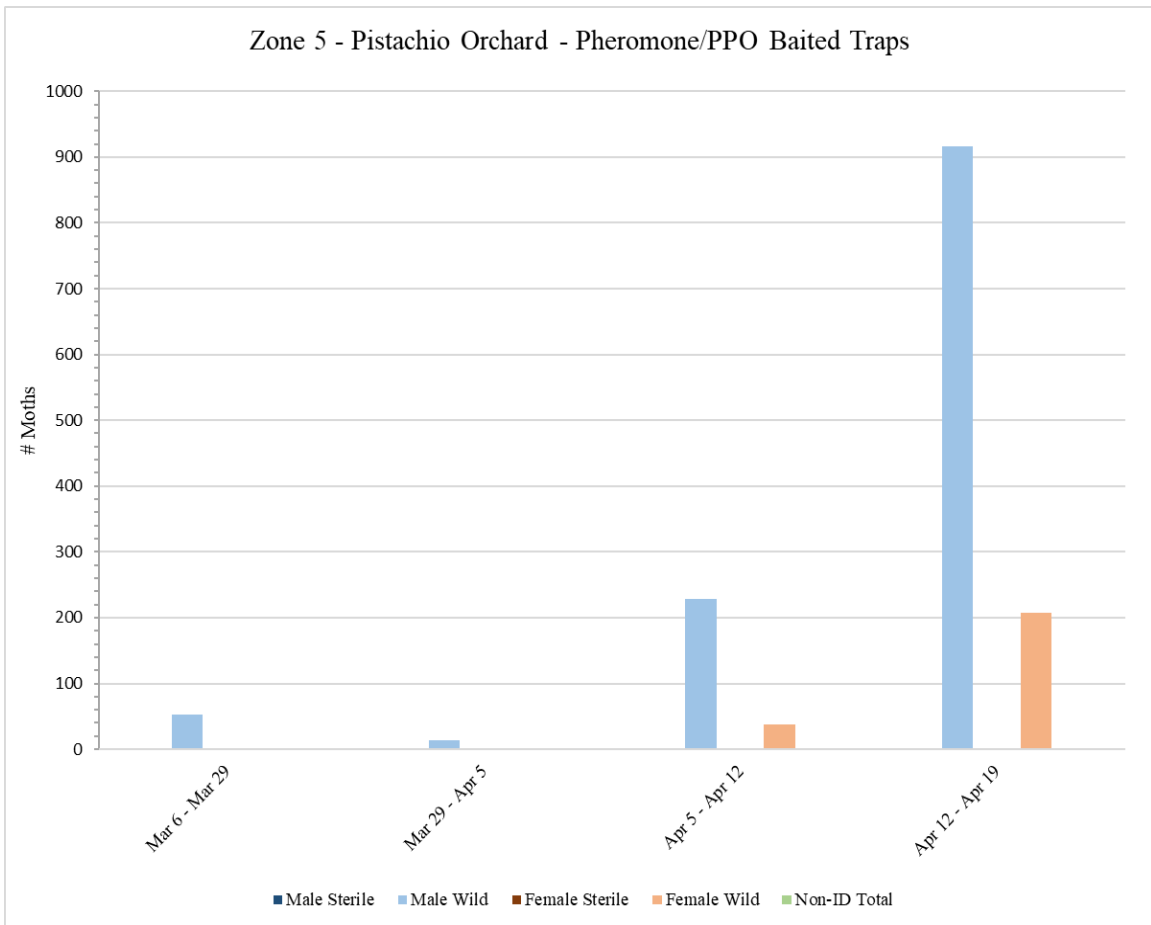
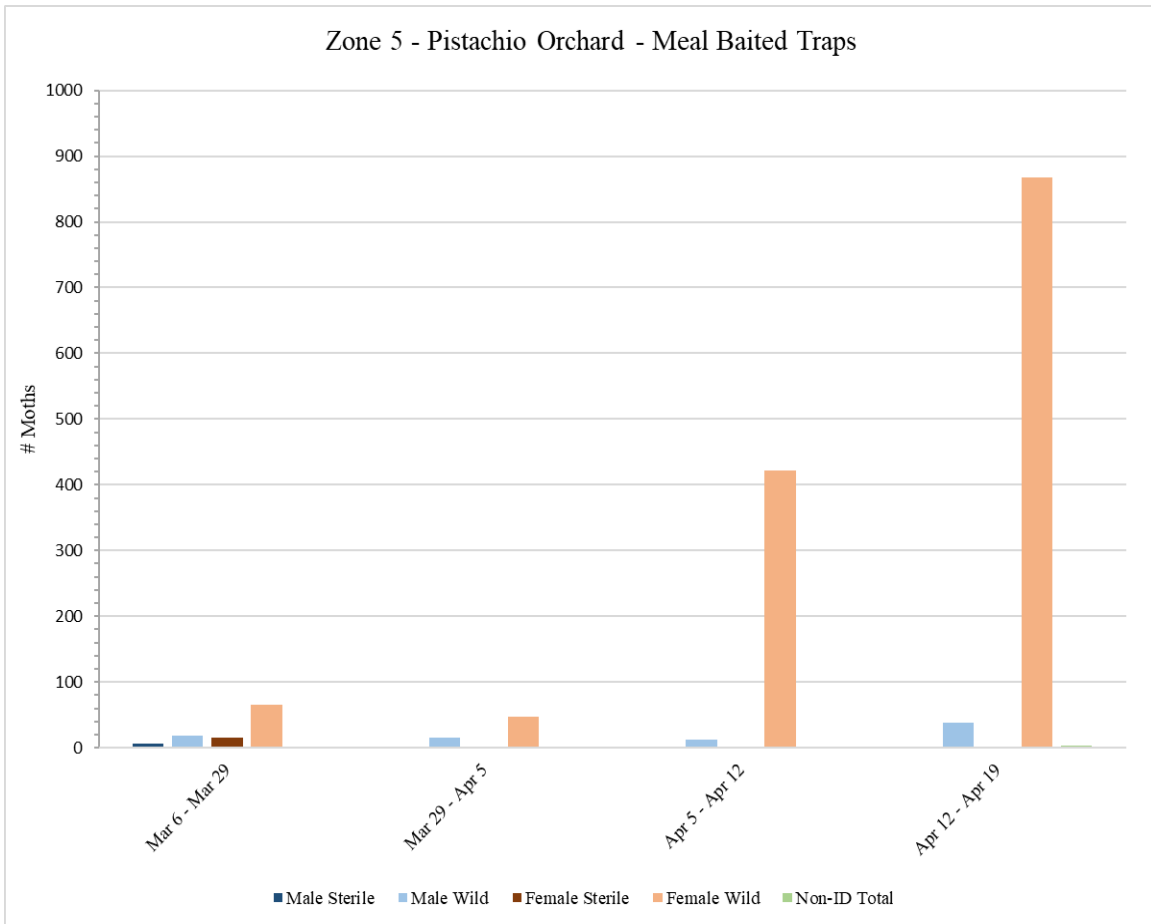


Zone 5 – Pistachio Orchard

A total of **36** meal-baited traps and **36** pheromone/PPO lure-baited traps were collected from Zone 5 on Wednesday, April 19.

Zone 5 - Pistachio								
Meal Baited Traps								
Dates Traps in Field	# of Releases During Trap Period	Male Sterile	Male Wild	Male Total	Female Sterile	Female Wild	Female Total	Non-ID Total
¹ Mar 8 – Mar 29	0	6	19	25	16	65	81	1
Mar 29 – Apr 5	0	0	15	15	0	47	47	0
Apr 5 – Apr 12	0	0	13	13	0	422	422	0
Apr 12 – Apr 19	0	0	38	38	1	868	869	3
¹ No traps were serviced in Zone 5 during the weeks of Mar 17 and Mar 24 due to excessive rain preventing access								

Zone 5 - Pistachio								
Pheromone/PPO Lure Baited Traps								
Dates Traps in Field	# of Releases During Trap Period	Male Sterile	Male Wild	Male Total	Female Sterile	Female Wild	Female Total	Non-ID Total
¹ Mar 8 – Mar 29	0	0	52	52	0	2	2	1
Mar 29 – Apr 5	0	0	14	14	0	0	0	0
Apr 5 – Apr 12	0	0	229	229	0	37	37	0
Apr 12 – Apr 19	0	0	916	916	0	207	207	1
¹ No traps were serviced in Zone 5 during the weeks of Mar 17 and Mar 24 due to excessive rain preventing access								



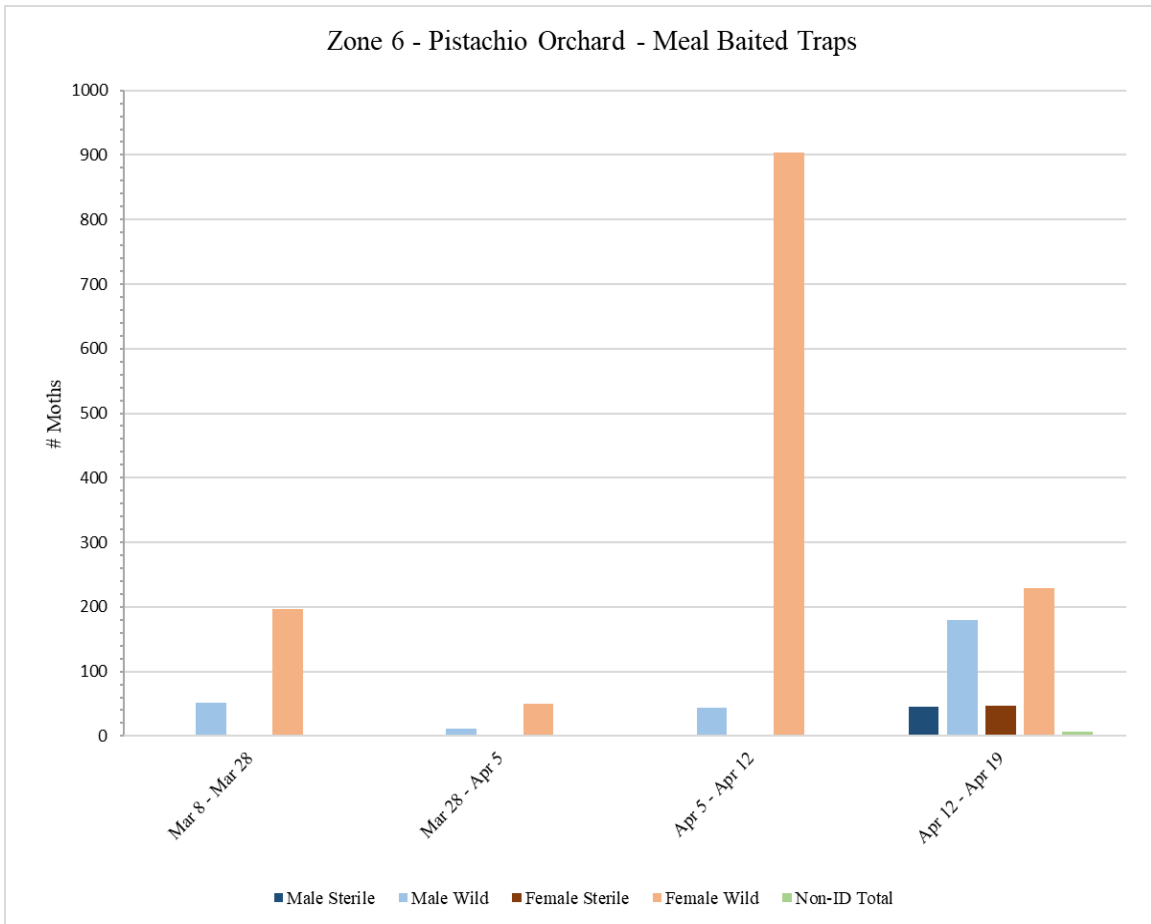
Zone 6 – Pistachio Orchard

A total of **36** meal-baited traps and **36** pheromone/PPO lure-baited traps were collected from Zone 6 on Wednesday, April 19.

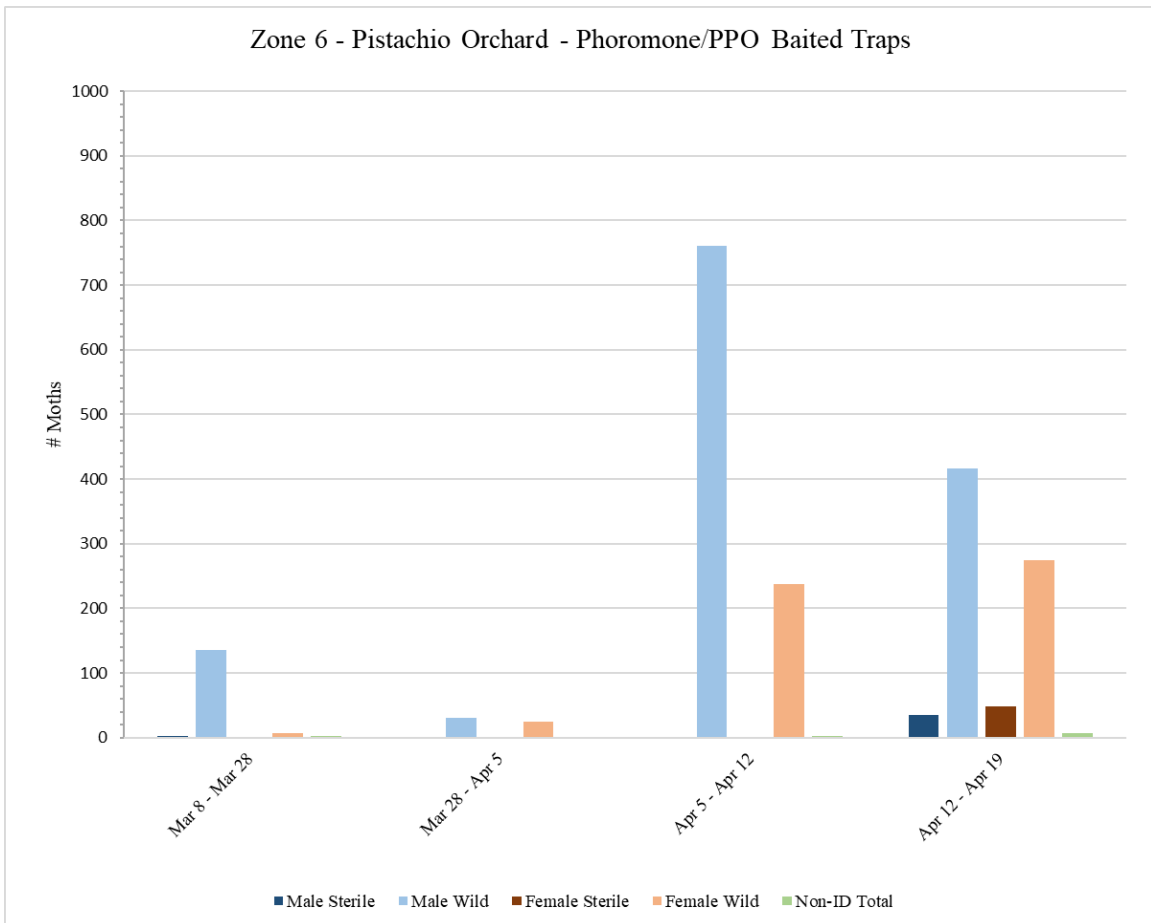
Zone 6 - Pistachio								
Meal Baited Traps								
Dates Traps in Field	# of Releases During Trap Period	Male Sterile	Male Wild	Male Total	Female Sterile	Female Wild	Female Total	Non-ID Total
¹ Mar 8 – Mar 28	0	0	51	51	0	196	196	2
Mar 28 – Apr 5	0	0	11	11	0	50	50	0
Apr 5 – Apr 12	0	0	44	44	0	904	904	0
Apr 12 – Apr 19	7	45	179	224	47	229	276	6
¹ No traps were serviced in Zone 6 during the weeks of Mar 17 and Mar 24 due to excessive rain preventing access								

Zone 6 - Pistachio								
Pheromone/PPO Lure Baited Traps								
Dates Traps in Field	# of Releases During Trap Period	Male Sterile	Male Wild	Male Total	Female Sterile	Female Wild	Female Total	Non-ID Total
¹ Mar 8 – Mar 28	0	3	135	138	0	7	7	2
Mar 28 – Apr 5	0	0	31	31	0	25	25	0
Apr 5 – Apr 12	0	0	761	761	0	238	238	2
Apr 12 – Apr 19	7	35	417	452	49	274	323	7
¹ No traps were serviced in Zone 6 during the weeks of Mar 17 and Mar 24 due to excessive rain preventing access								

Zone 6 - Pistachio Orchard - Meal Baited Traps



Zone 6 - Pistachio Orchard - Phoromone/PPO Baited Traps



Zone 7 – Almond Orchard

A total of **36** meal-baited traps and **36** pheromone/PPO lure-baited traps were deployed in Zone 7 on Thursday, April 20.

IV. Quality Control

QC tests are performed on samples taken from each shipment of sterile NOW moths. These tests include: zero-hour mortality rates, zero-hour mating dissections, forty-eight-hour mating dissections, seven-day longevity monitoring, and crush tests. Throughout the span of a week, Monday through Sunday, the results of each test are averaged. Below are the QC results from samples of sterile NOW moths for Mag 1, released over Zones 1 and 3, and Mag 2, primarily released over Zones 4 and 6, during the week of Monday, April 10, 2023 to Sunday, April 16, 2023:

Mag 1:

- 2% of moths from samples found dead at zero hour
- 1% of moths from samples found to have mated at zero hour
- 33% of moths from samples found to have mated after forty-eight hours
- 94% of moths from samples remained alive after seven days in BioChamber
- 96% of moths from samples found to have distinct red dye markings

Mag 2:

- 2% of moths from samples found dead at zero hour
- 3% of moths from samples found to have mated at zero hour
- 46% of moths from samples found to have mated after forty-eight hours
- 85% of moths from samples remained alive after seven days in BioChamber
- 90% of moths from samples found to have distinct red dye markings