

# Augmenting Quino Checkerspot Butterfly (*Euphydryas editha quino*) in the San Diego National Wildlife Refuge

4-year Review  
August 26<sup>th</sup>, 2020



RECON



CREEKSIDE  
SCIENCE



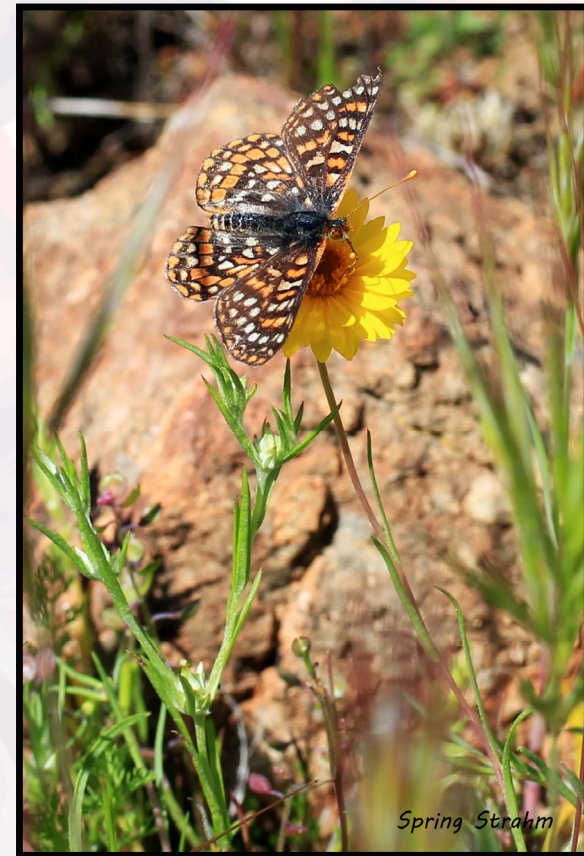
# Project Goals

- Increase the number of stable QCB subpopulations in SDNWR
- Methodology for rearing and release
- Improve understanding
  - Relevant to management

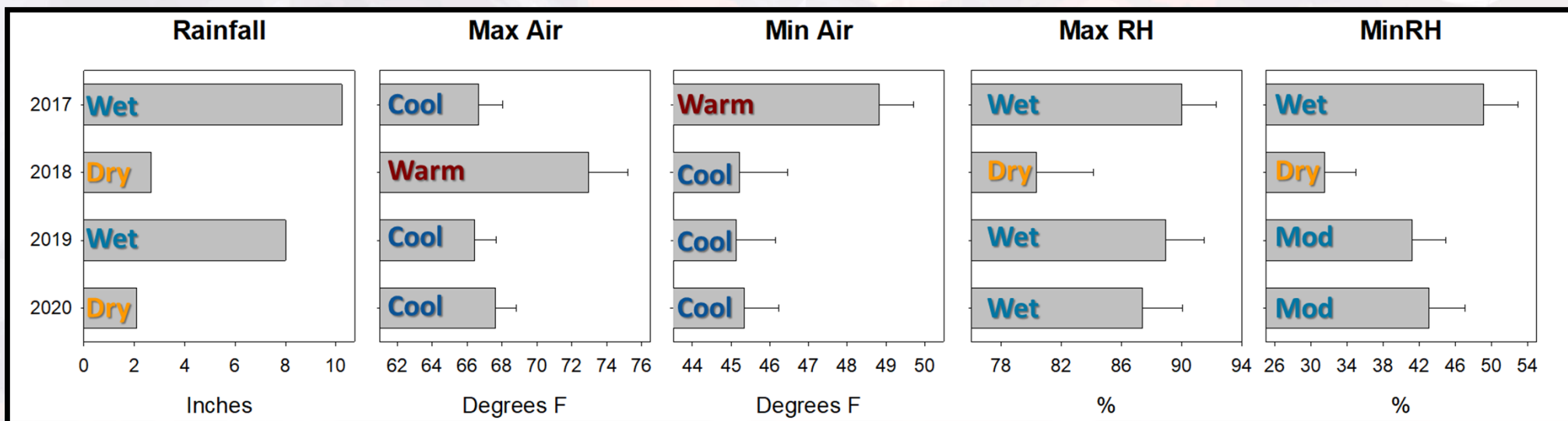
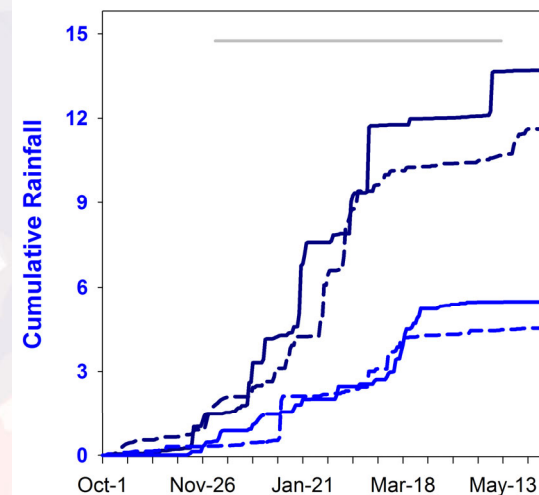


# Quino Checkerspot Butterfly

- Endangered
- Southern CA, Northern Baja
- Early season butterfly: larval diapause
- Early season annual host plant: *Plantago erecta*
- Boom and bust population
- Metapopulation structure

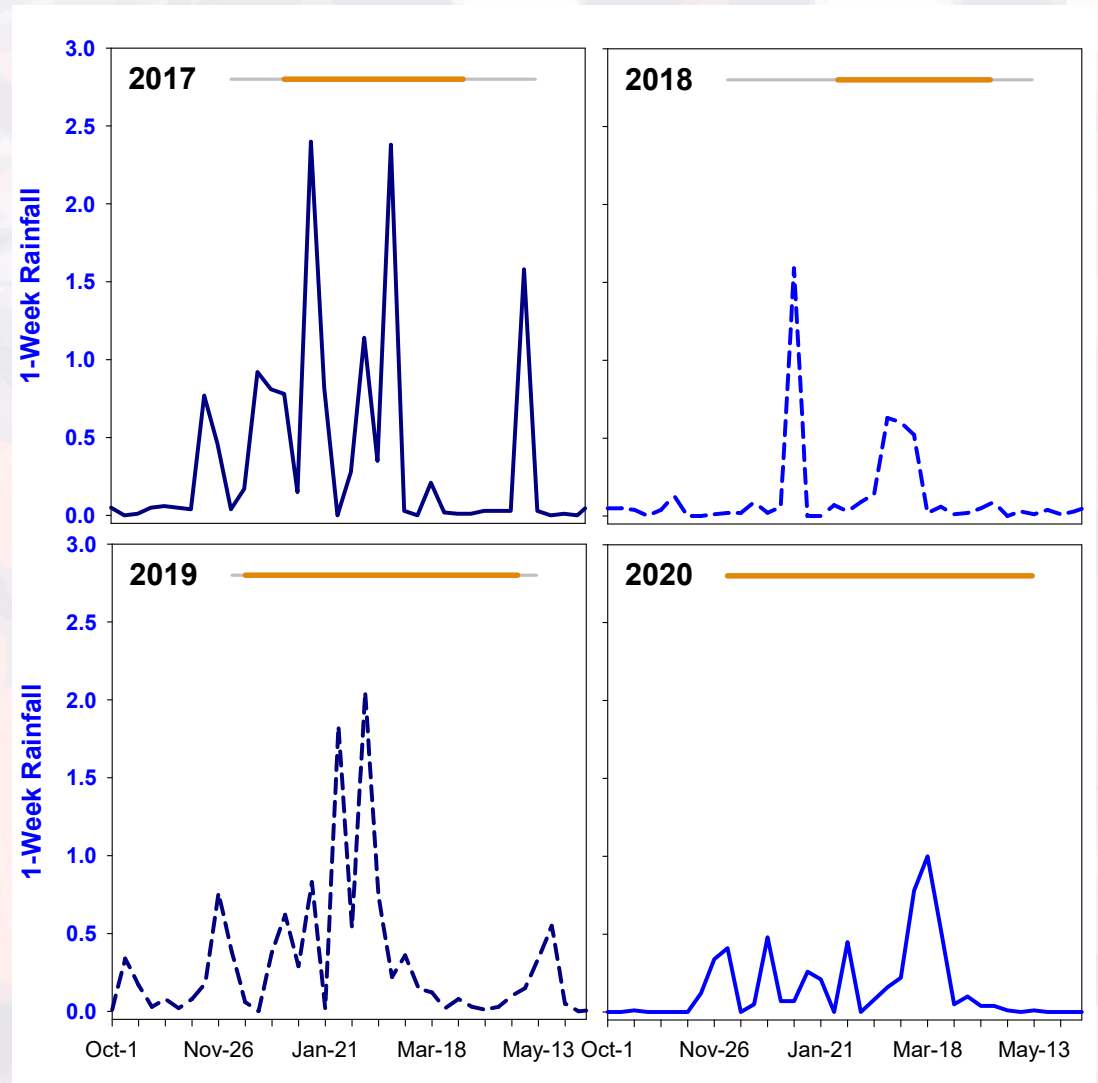


# Weather



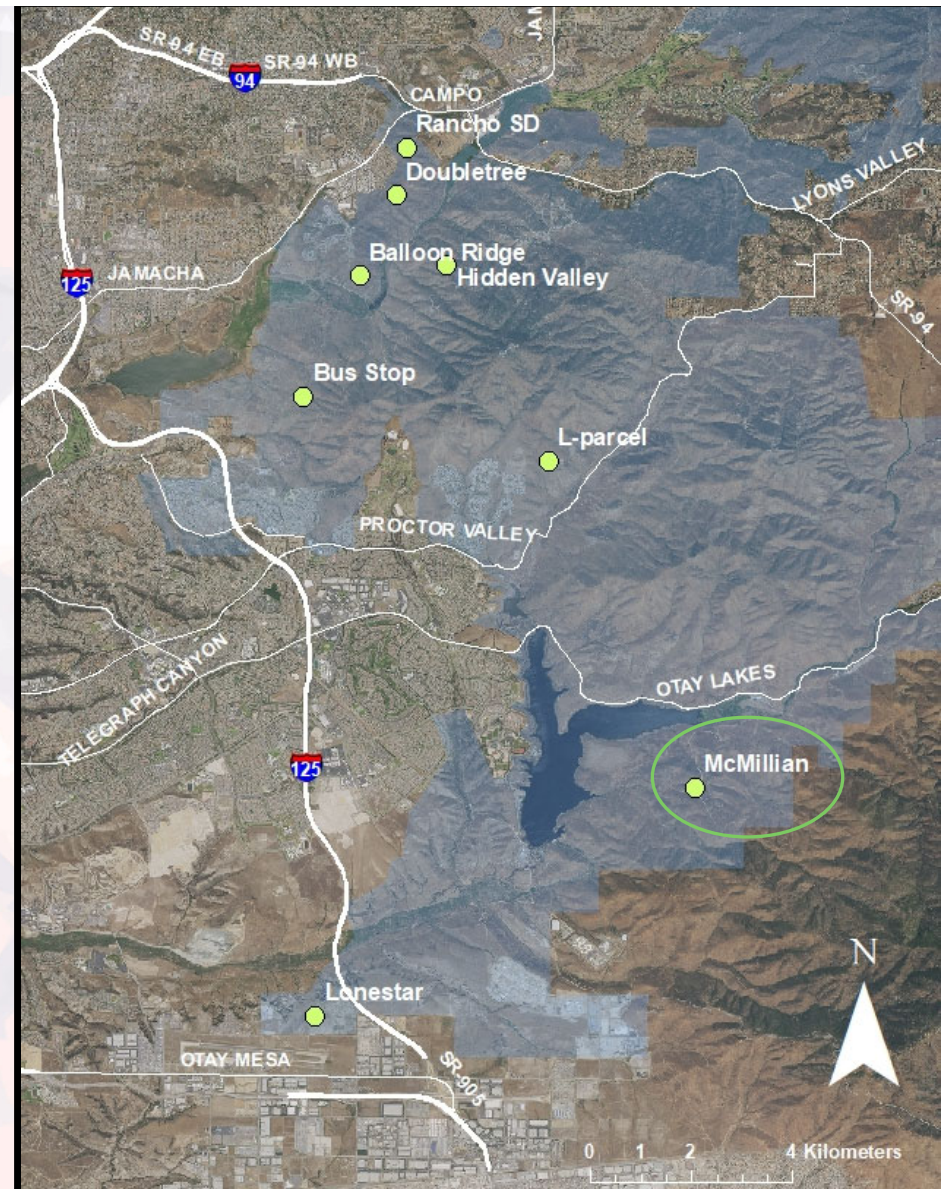
# Rainfall pattern

- High V. low
- Consistent V. irregular



# Sites

Site	2017	2018	2019	2020	2021
Hidden Valley	1513	--	--	--	--
Bus Stop	--	1711	--	1404	--
L-parcel	--	1729	--	--	--
Lonestar	--	1692	--	--	--
Balloon Ridge	--	--	1380	1368	--
Rancho San Diego	--	--		--	--
Double Tree	--	--	--	--	2520
<b>Totals</b>	<b>1513</b>	<b>5132</b>	<b>1380</b>	<b>2772</b>	<b>2520</b>
<b>Grand Total</b>	<b>13,317</b>				

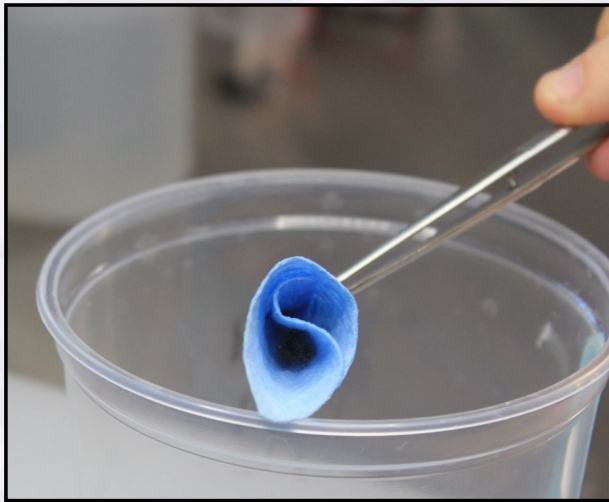


# Collect Founders



# Rearing Larvae

- San Diego Zoo Butterfly Conservation Lab
- Ambient conditions



# Release the larvae!

- In diapause
- Ambient conditions
- Woken by environmental cues
- Low contact

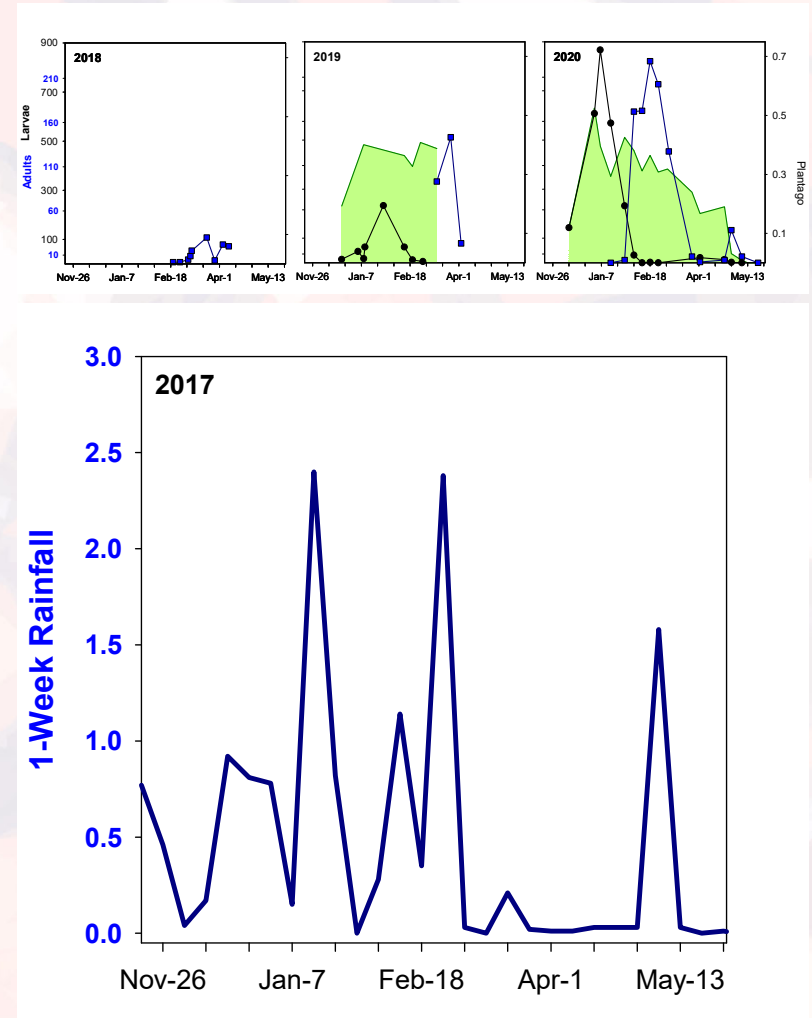
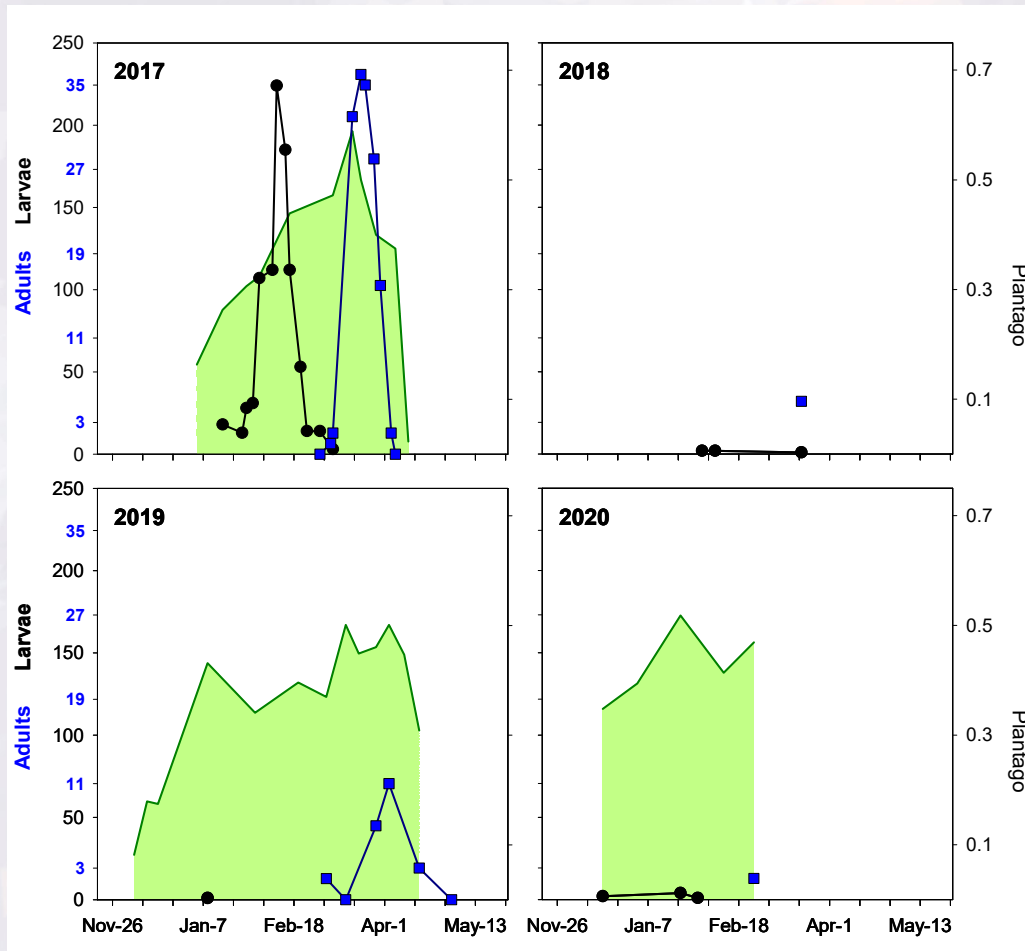


Photos courtesy of San Diego Zoo Global

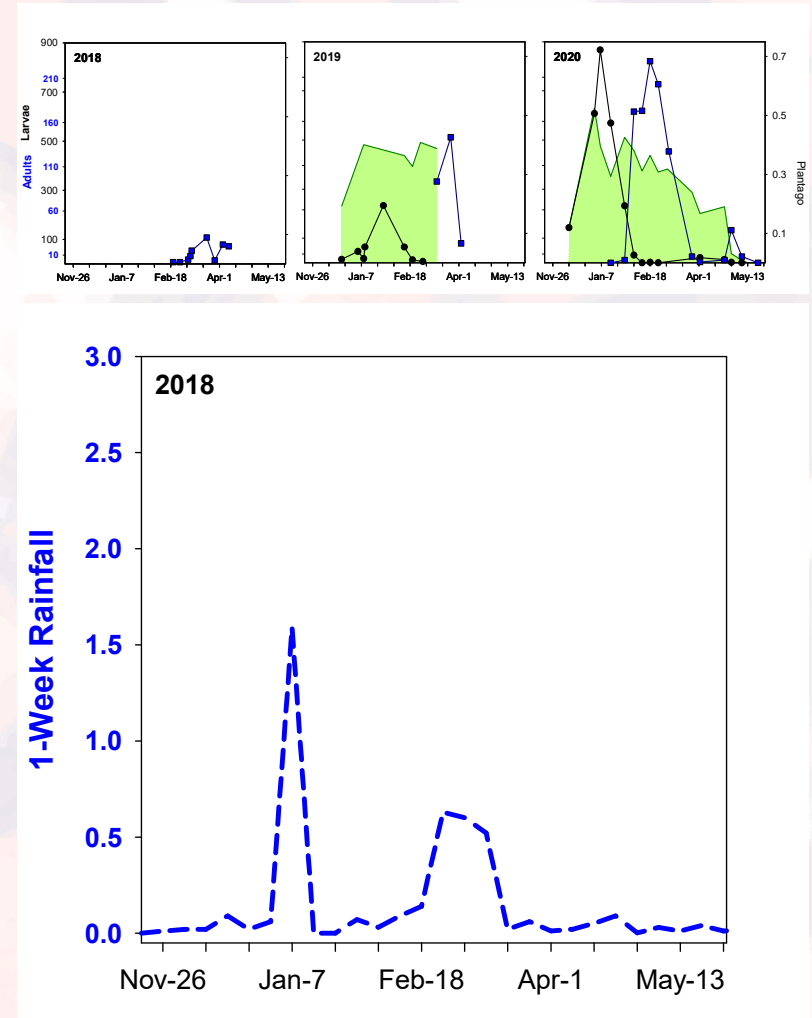
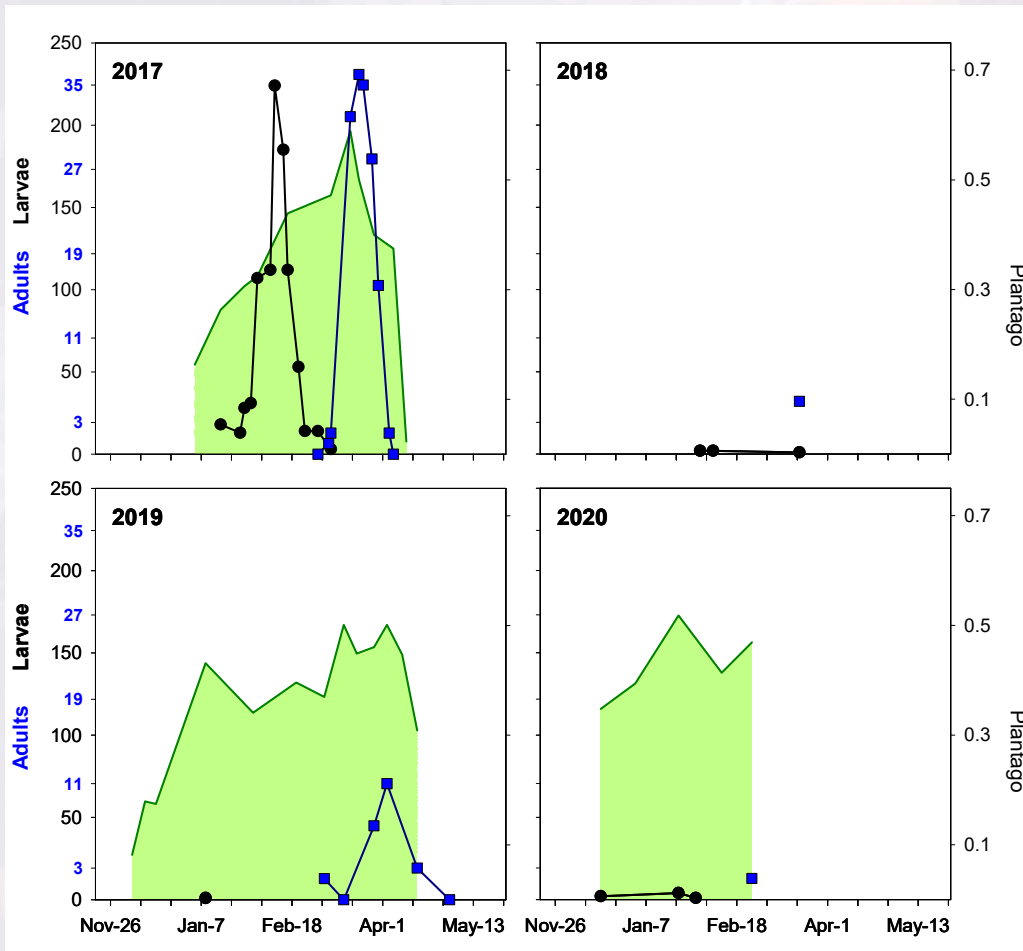
Hooray!



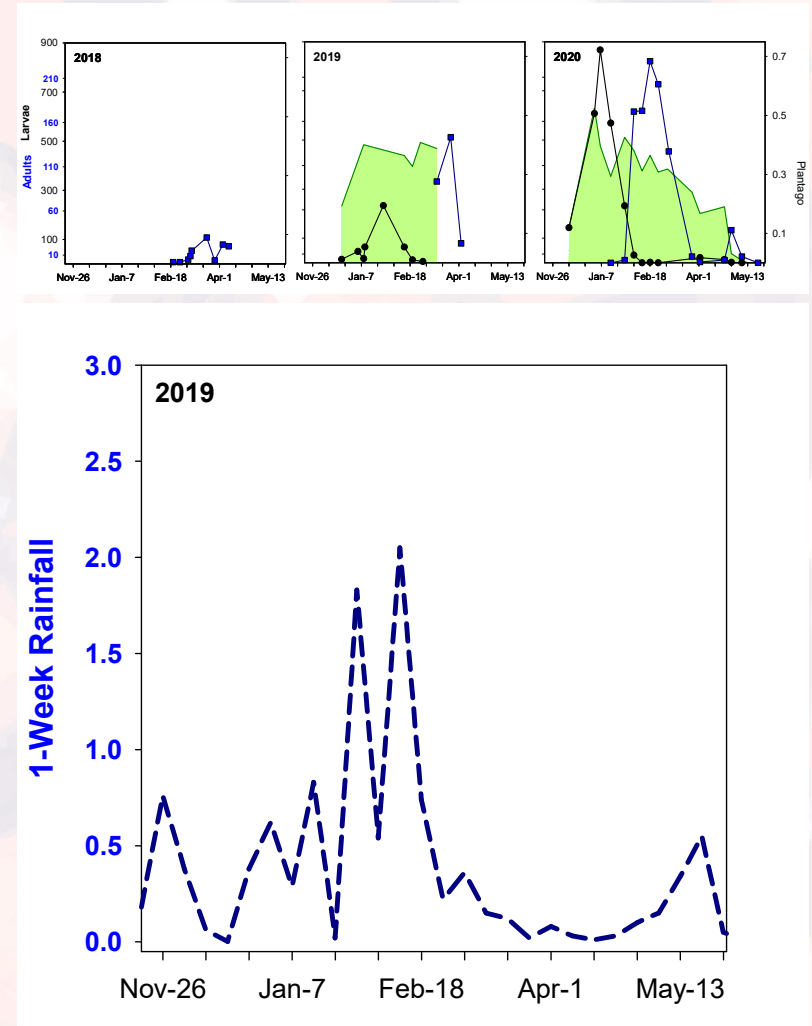
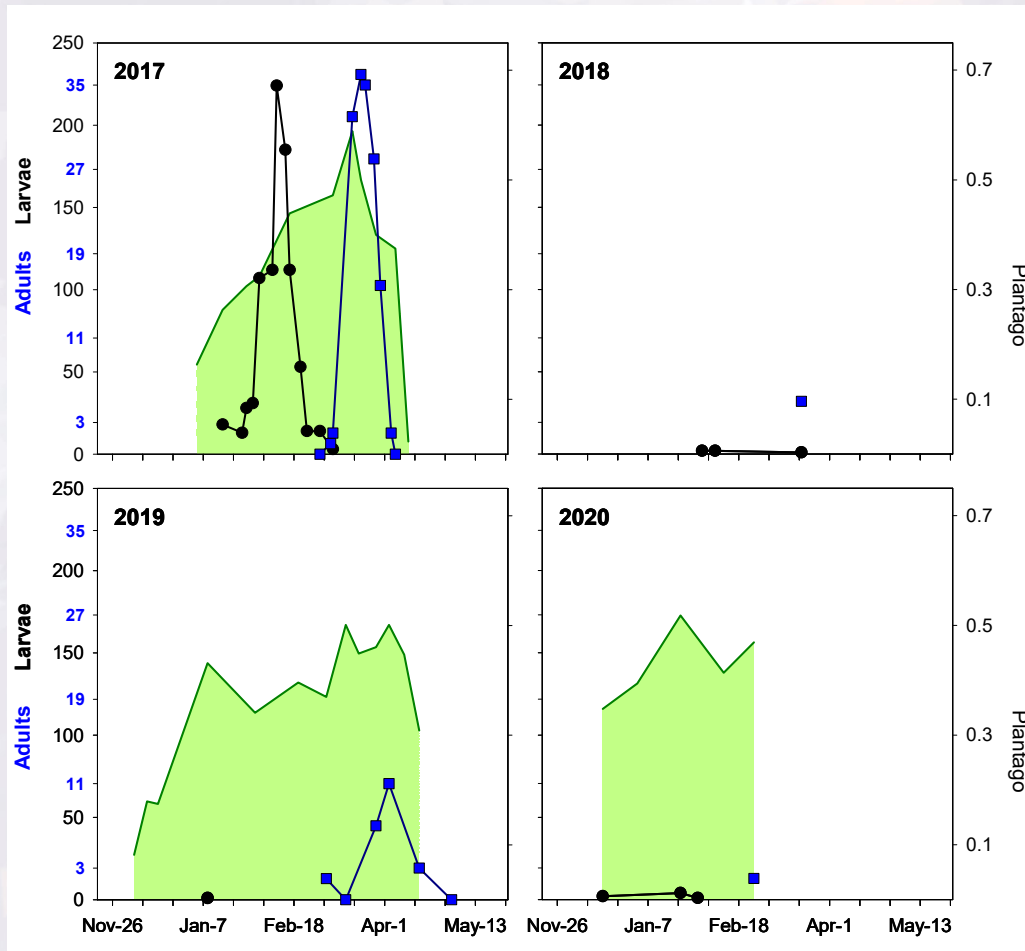
# Hidden Valley



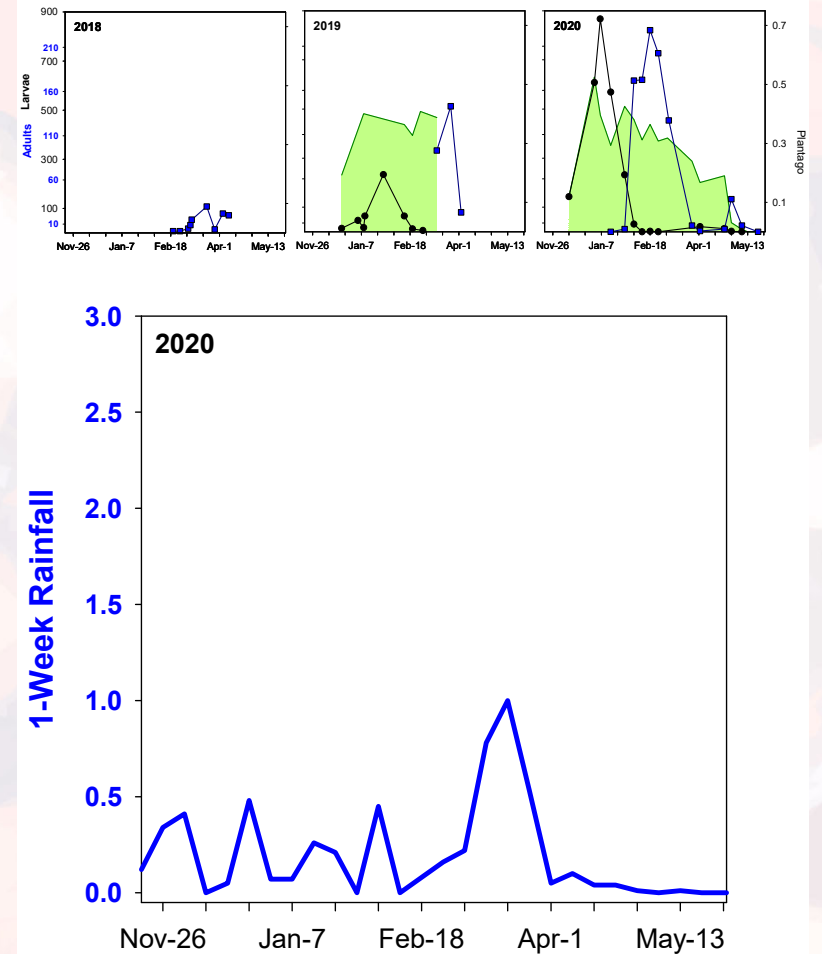
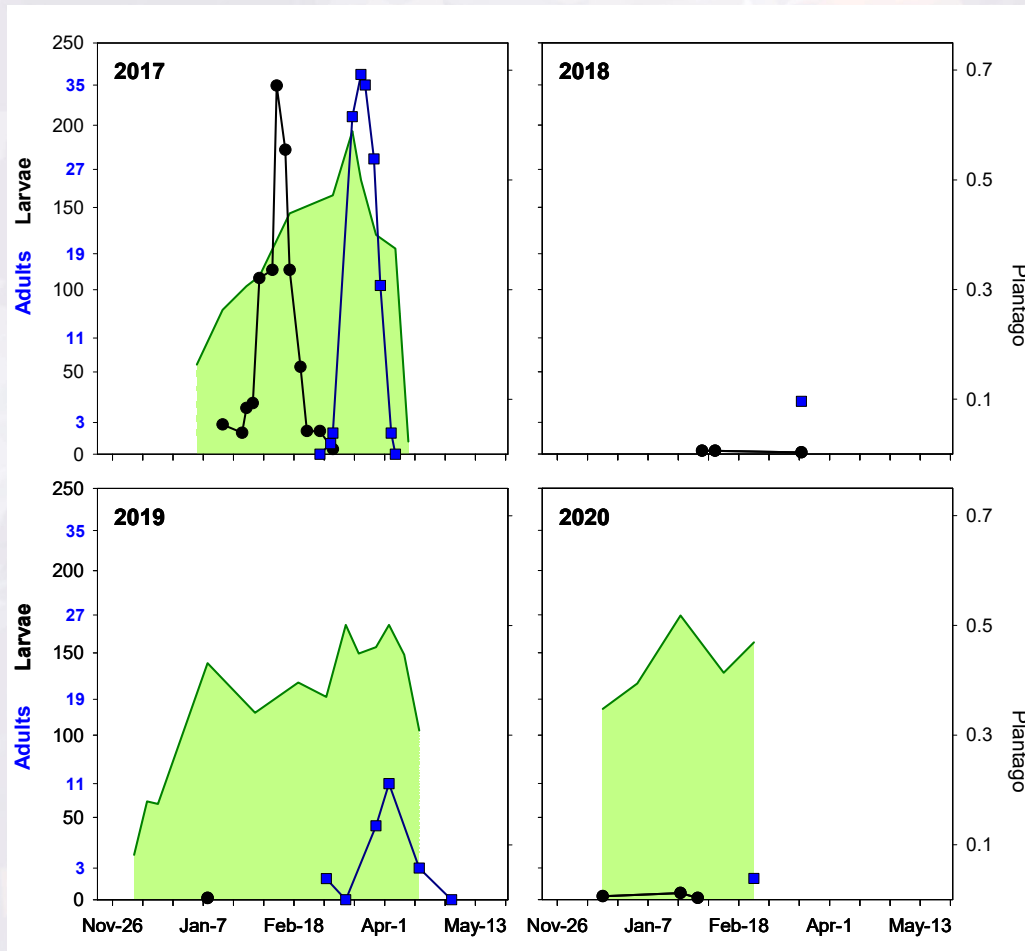
# Hidden Valley



# Hidden Valley



# Hidden Valley

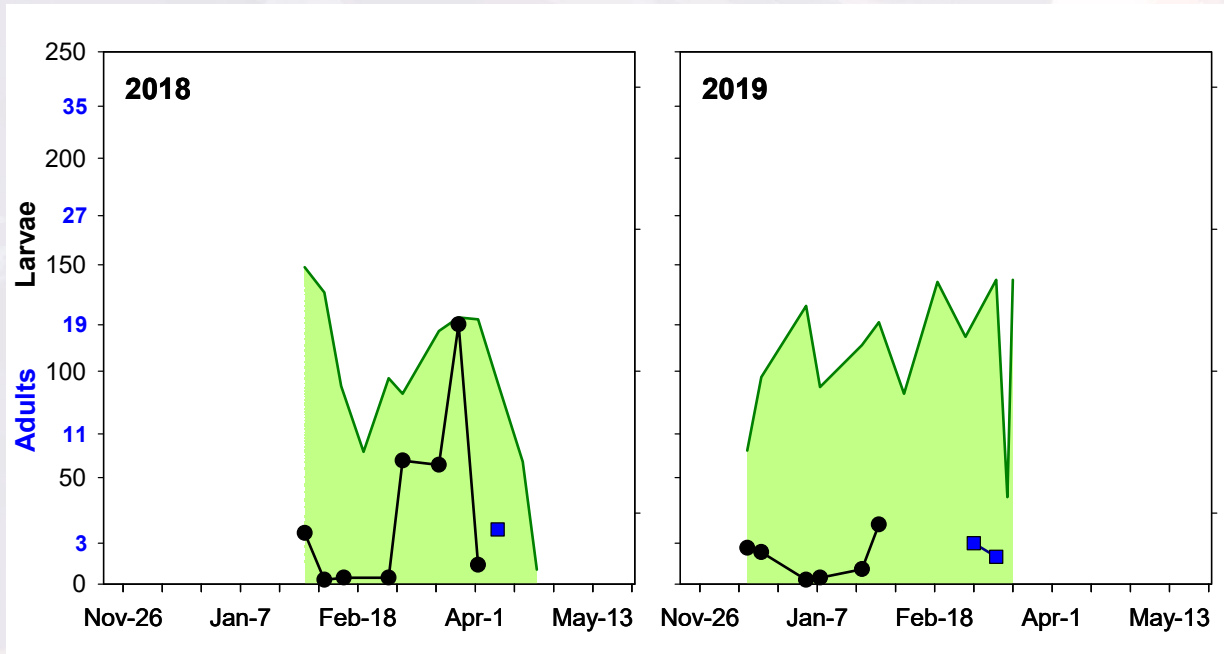
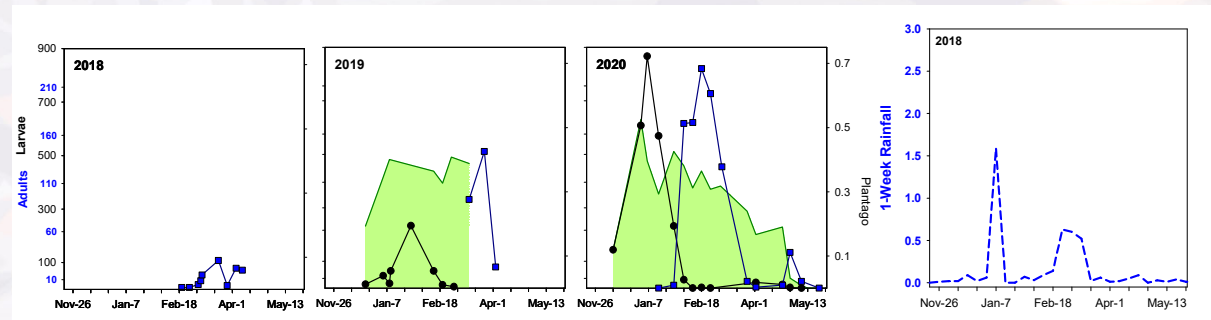


# Lessons Learned

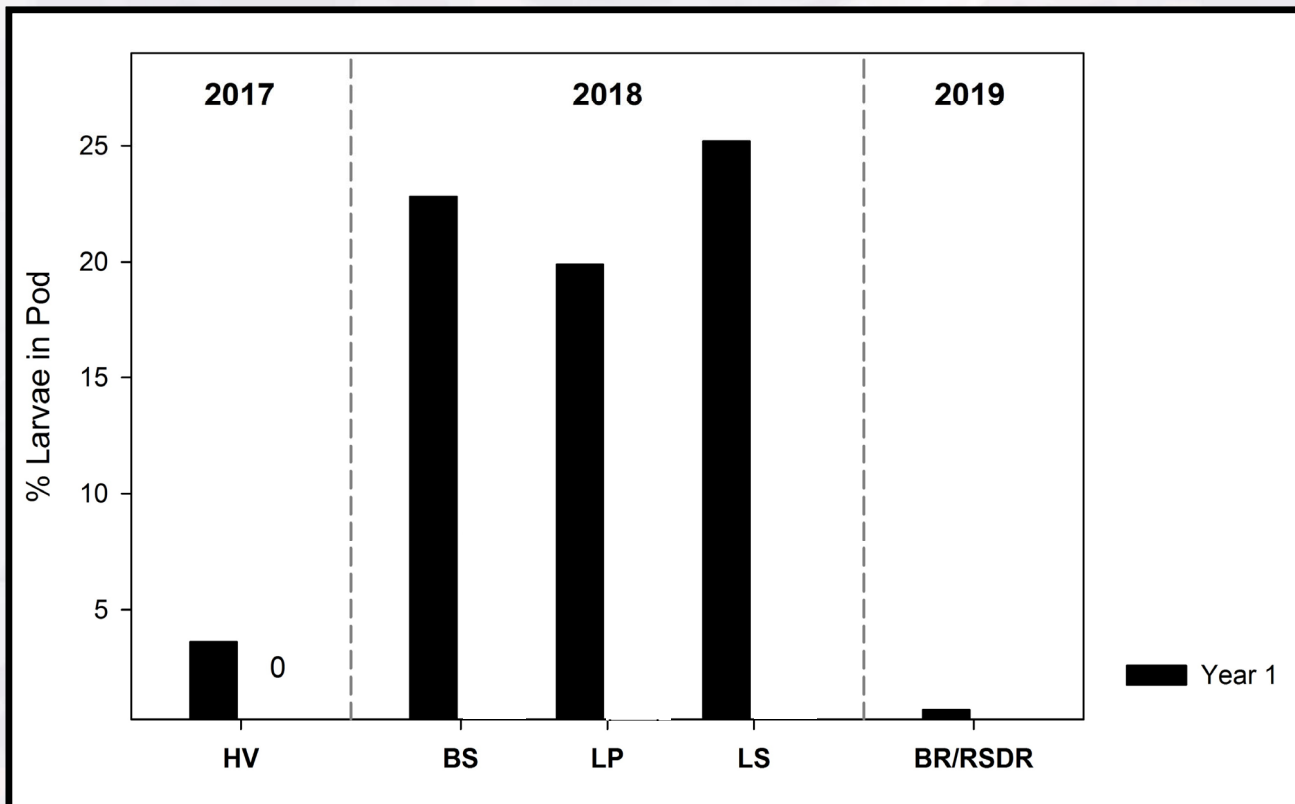
- Release method works
- Females may be more fecund in favorable years... but why?
- Population persisting



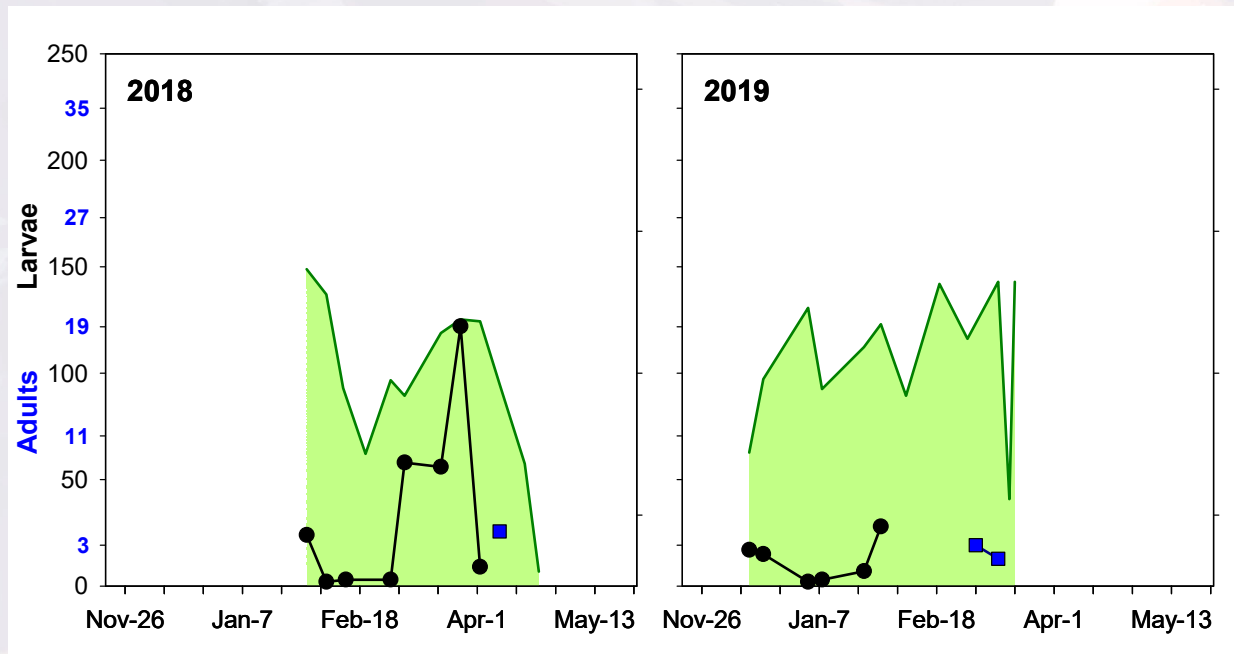
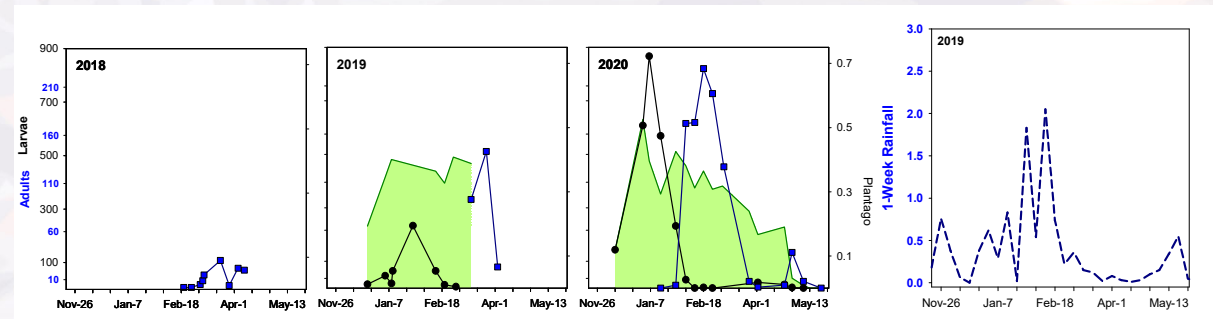
# Bus Stop



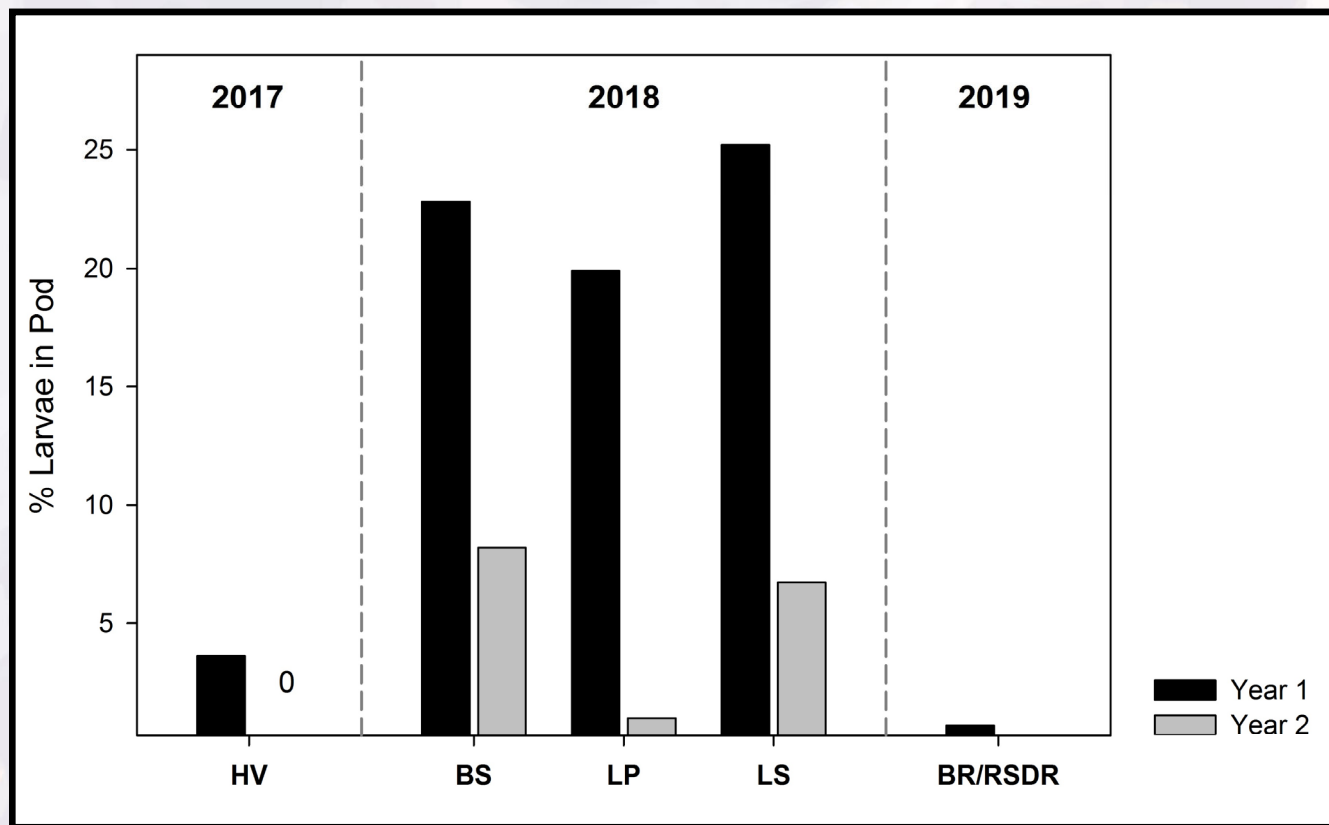
# Opting out



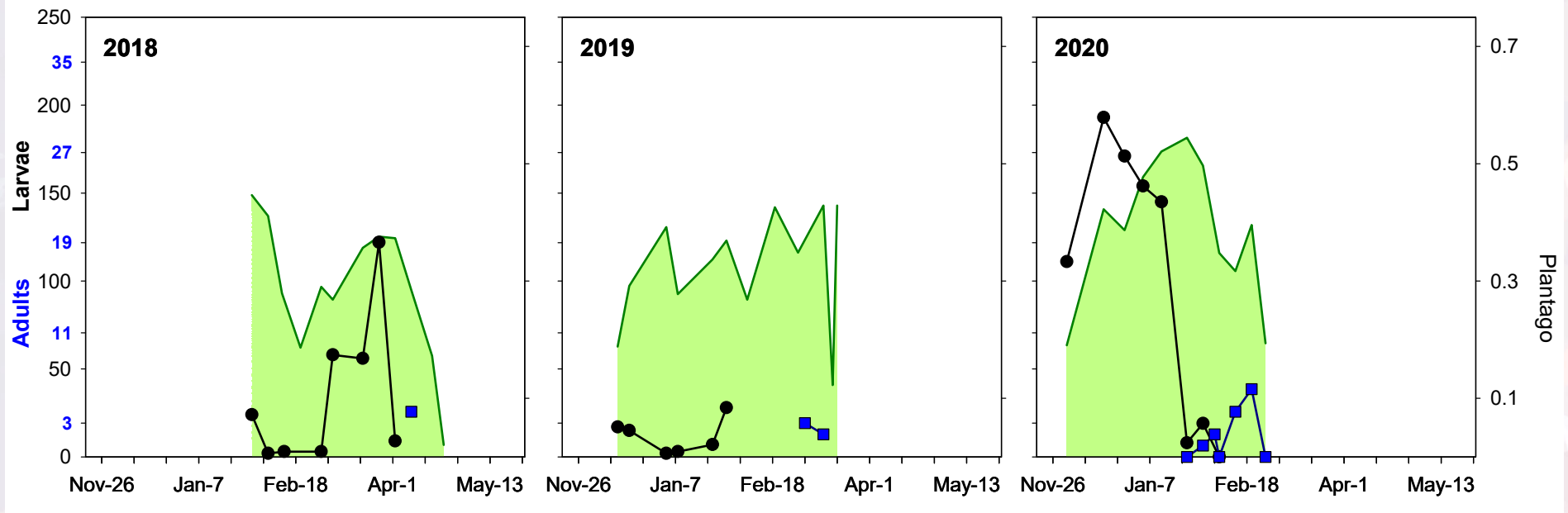
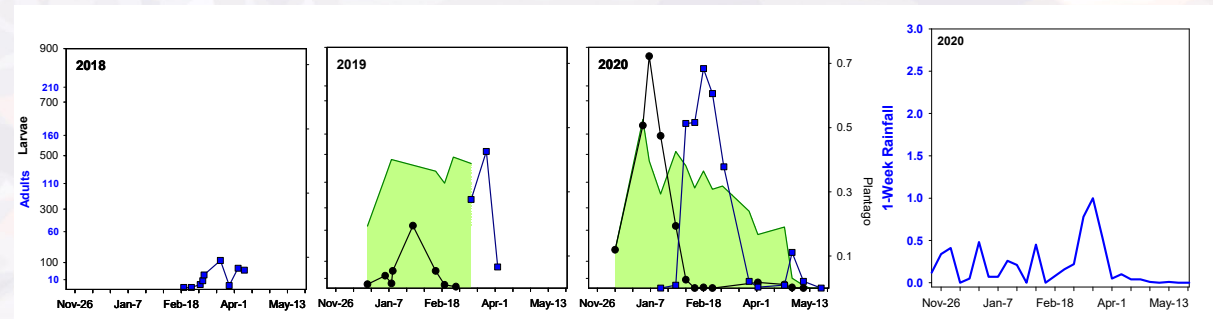
# Bus Stop



# Multiyear Diapause



# Bus Stop



# Lessons Learned

- Interpret success relative to year
- Rapid response to environment
- Red *Plantago* may be unpalatable
- Larvae can “wake-up”
- Larvae don’t always break diapause
- Dormant larvae broke diapause in 2019
- Some continued prolonged dormancy



# Tomfoolery

Note: Not totally satisfied with my experience

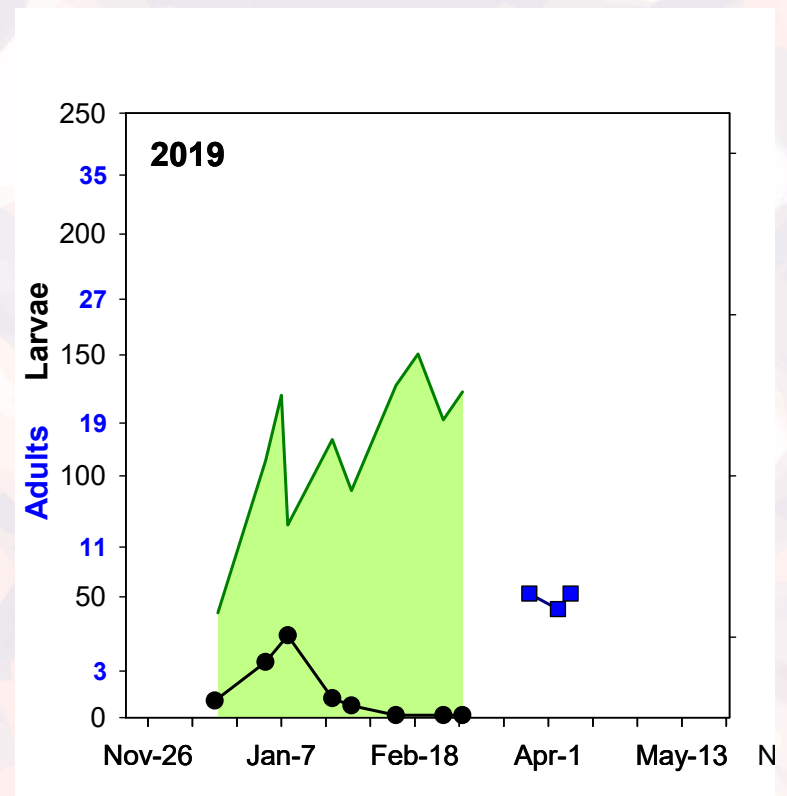
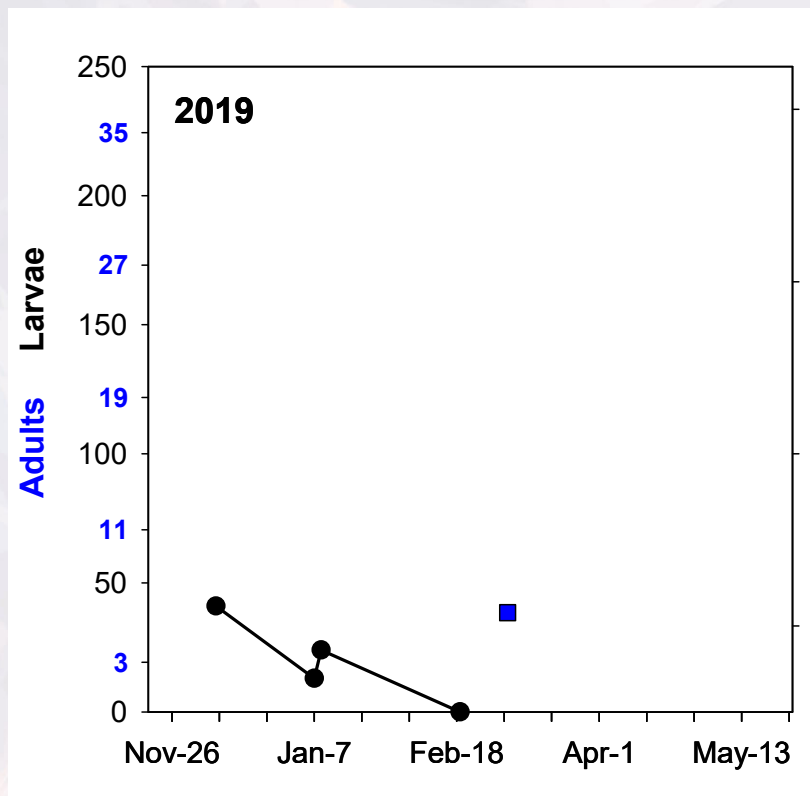
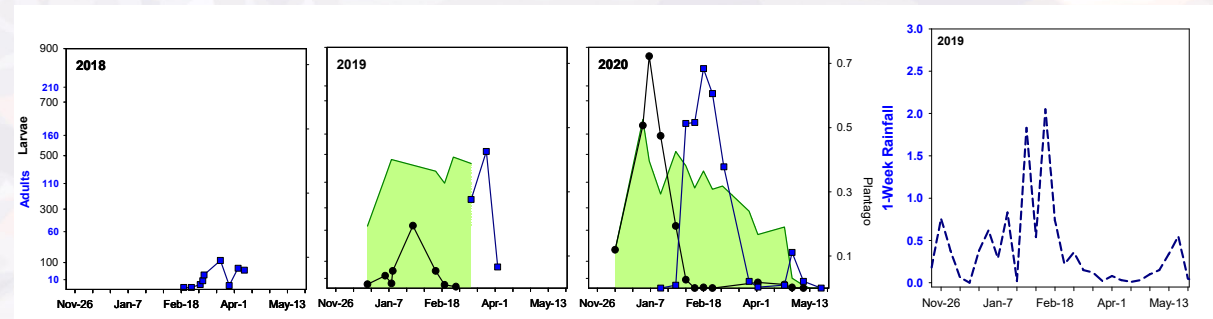


# Balloon Ridge Bail Out

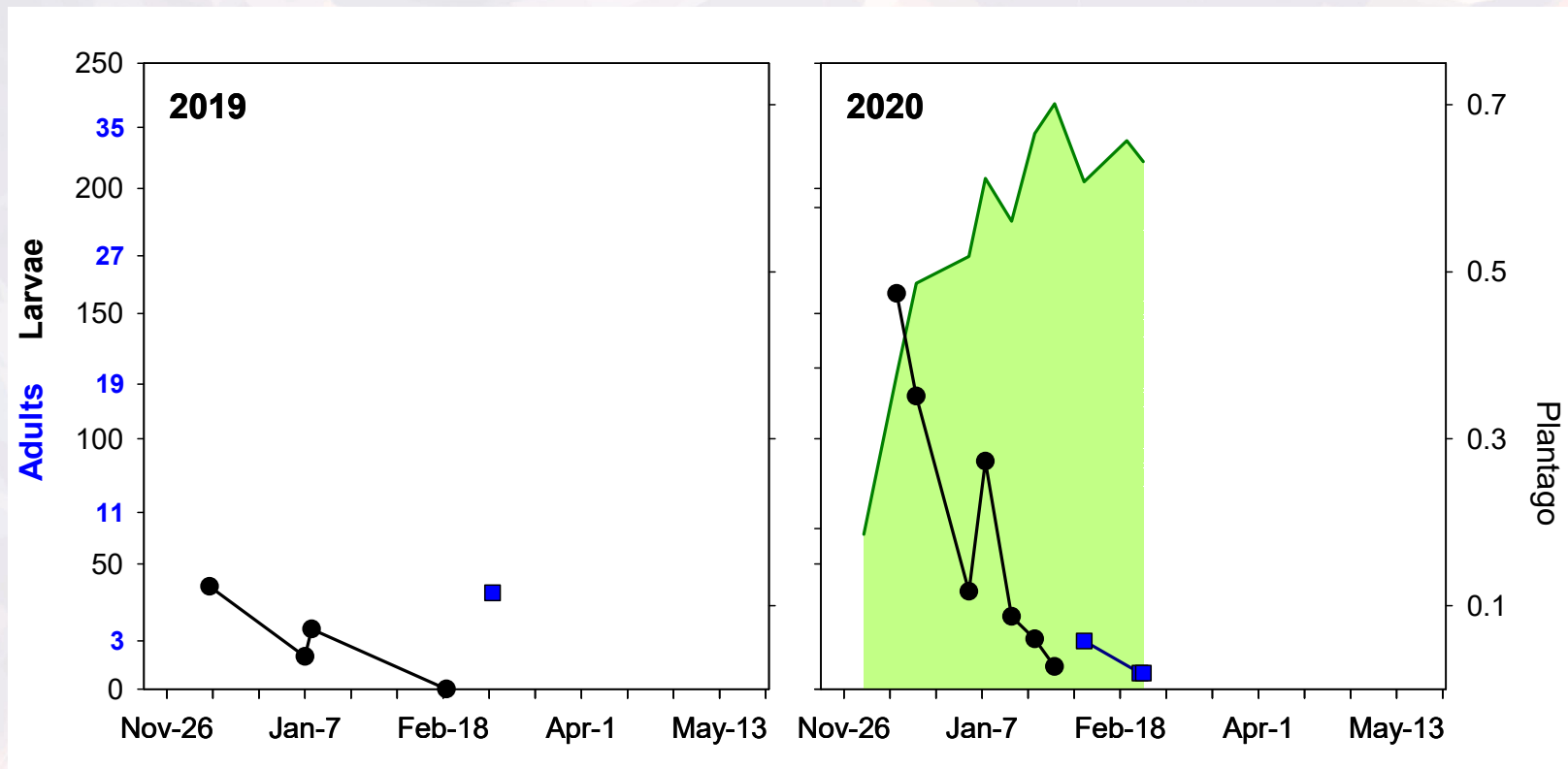
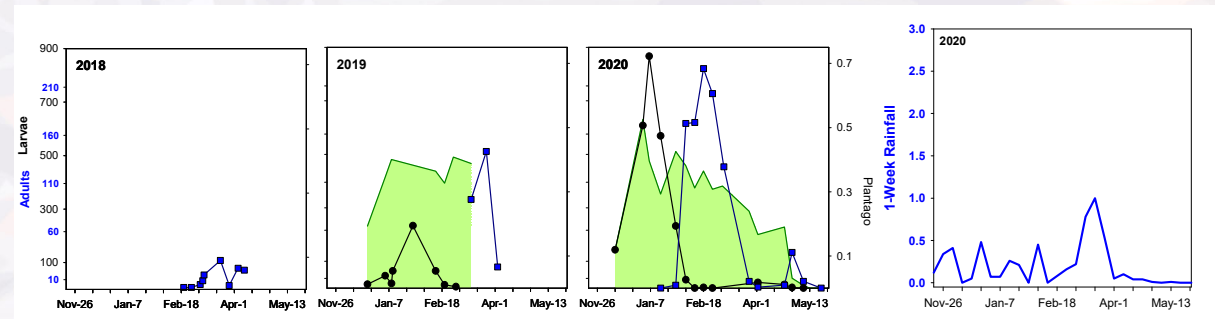
- Active larvae (7mm)
- Scant patches of host plant
- Consequences:
  - Disturbance
  - Number in pods and sites unknown
  - Additional site to monitor
- Govt. shut down 11 days later
- Pods got disturbed AGAIN



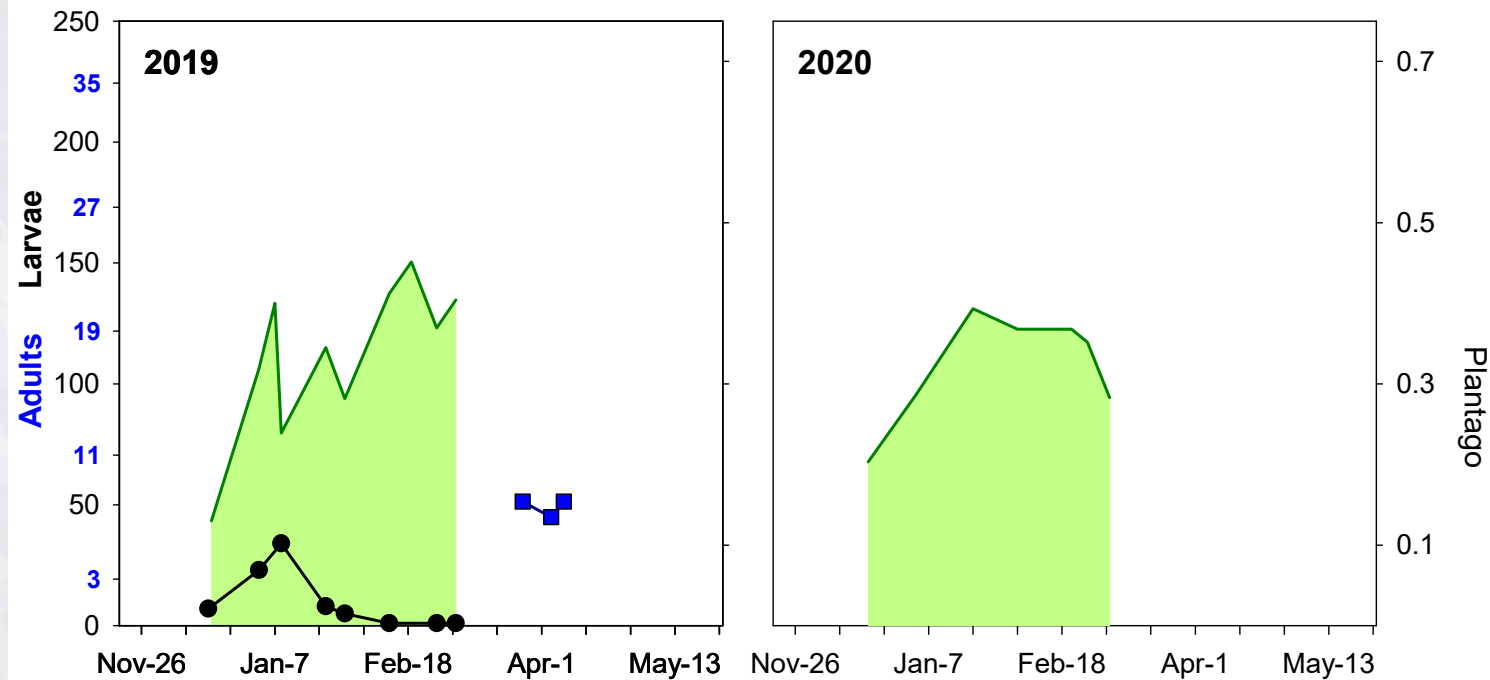
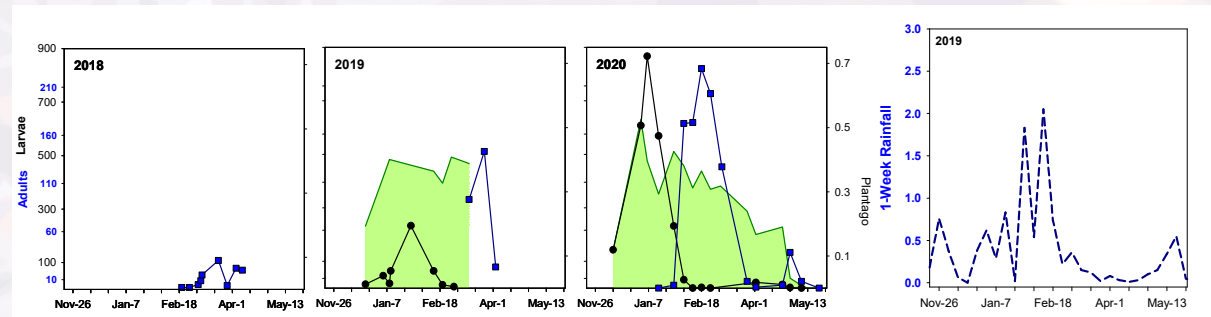
# Balloon Ridge RSDR



# Balloon Ridge



# Rancho SD



# Lessons Learned

- Host plant patches not all the same
- People be people



# Covid 19

- Released larvae prior to the onset of diapause
- Followed by cool rainfall
  - New flush of *Plantago*
  - Larvae did not go into diapause as expected



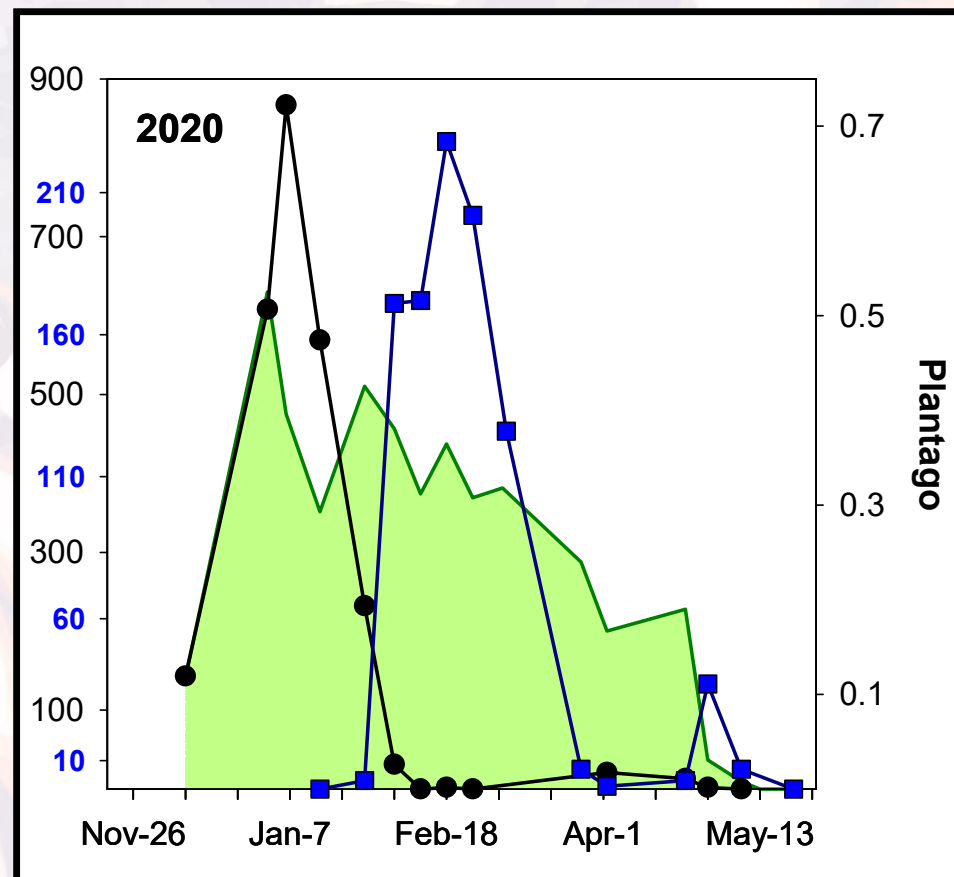
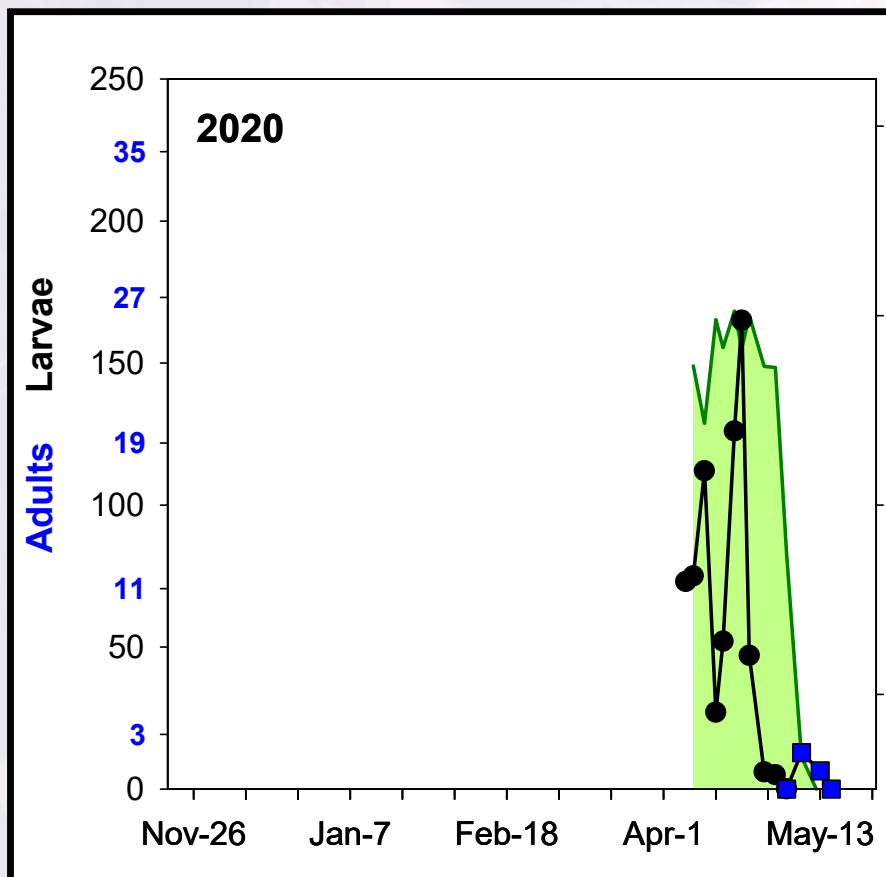
# Results

- Many larvae  $>30\text{mm}$ 
  - Can they diapause?
- At least 2 skipped diapause



Photos Courtesy of Michael Ready and Paige Howorth

# Doubletree V McMillian



# Mortality and parasitism

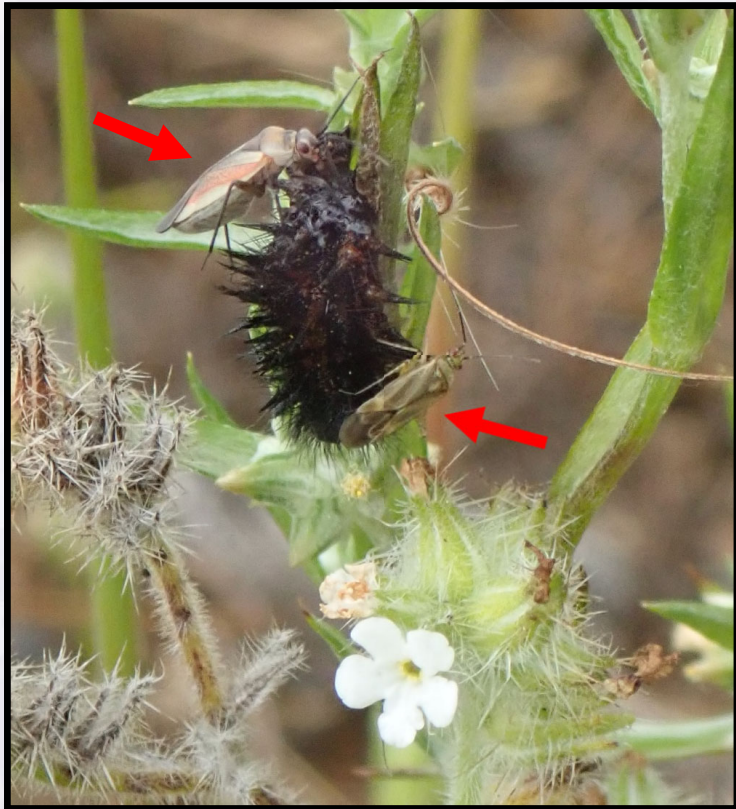


Photo Courtesy of Michael Ready

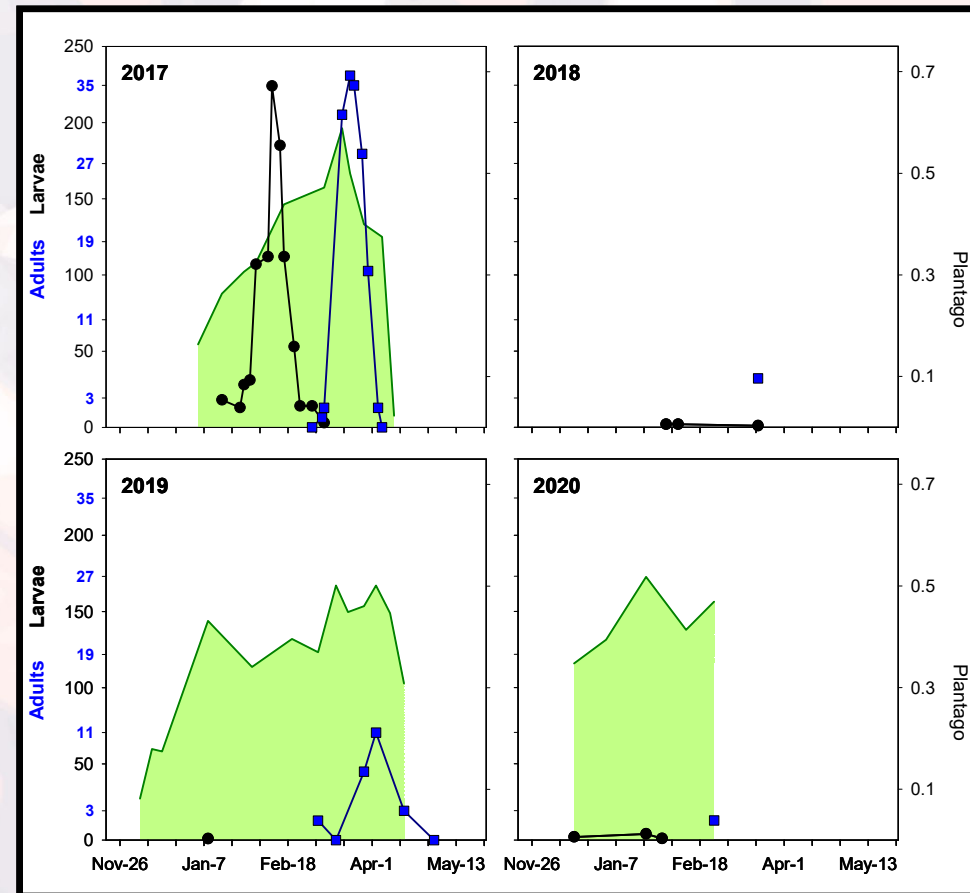
# Lessons learned

- Weather is SUPER important
- Larvae don't HAVE to go into diapause
  - Was it a fluke?
- Late season fakeouts (2018, 2020)
- Predators and parasites



# Does it work?

- ✓ **Survival of *released generation***
- ✓ **Breeding by *released generation***
- ❑ **Breeding by *offspring***
  - Prolonged dormancy = difficult to say

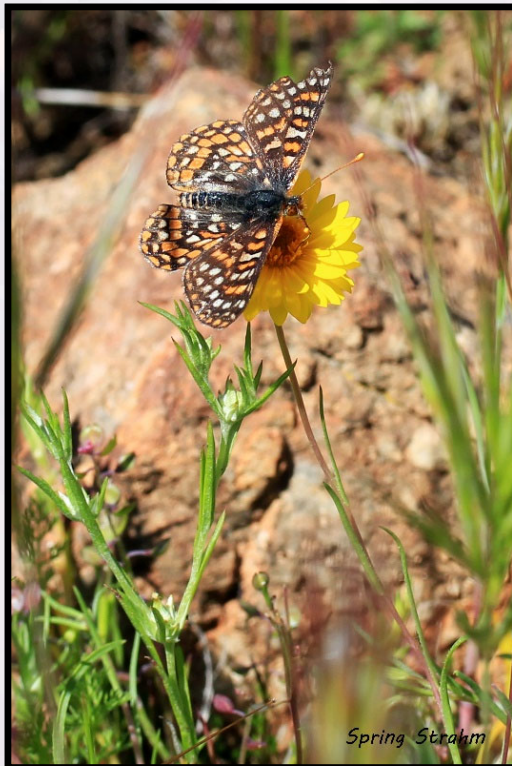
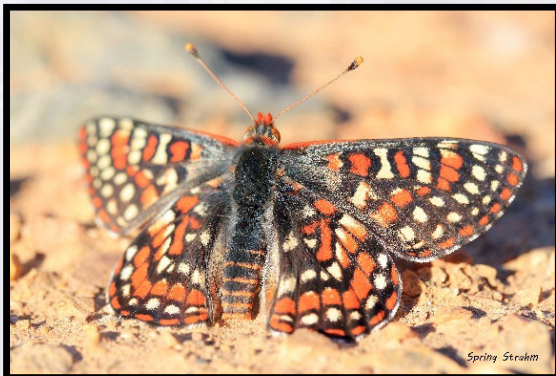
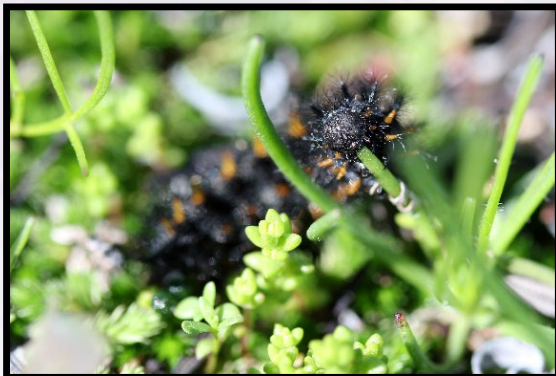


# Takeaways

- Incredibly plastic life history
- “Prolonged dormancy”/ bet hedging
- Great for variable environments
- Climate change



# Questions?



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