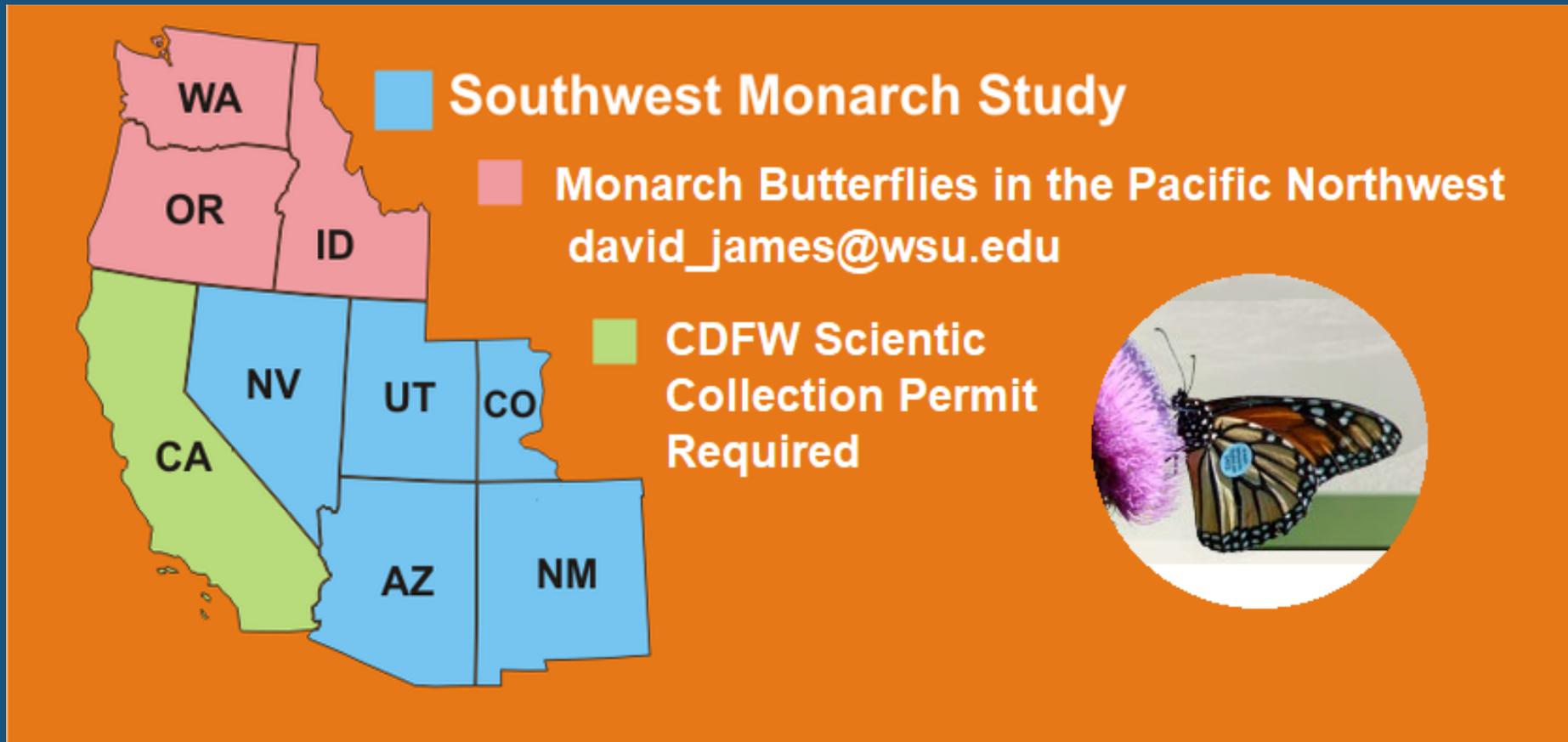


Divergent Monarch Migration Destinations and Overwintering Strategies in the Southwest

GAIL MORRIS, SOUTHWEST MONARCH STUDY

Divergent migration destinations and overwintering strategies of monarch butterflies in the Southwest

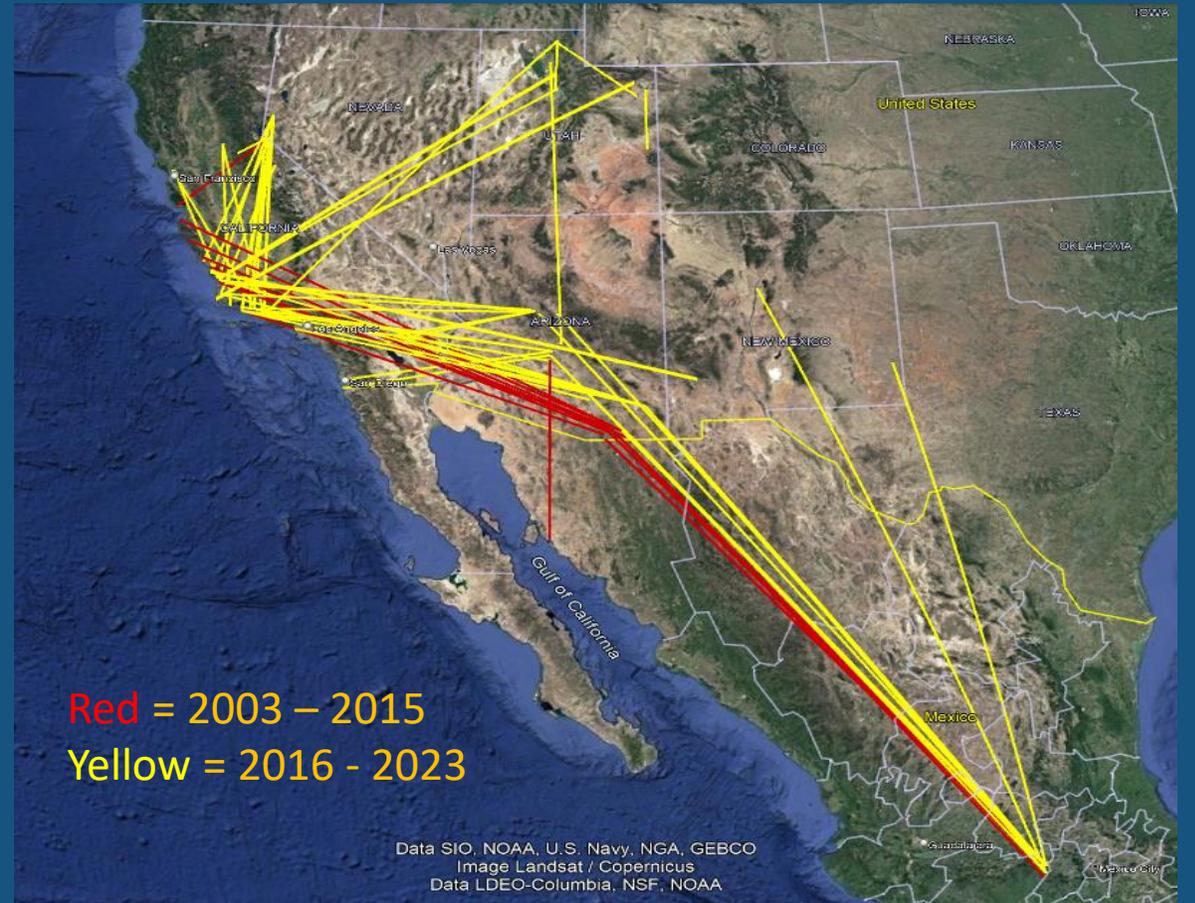
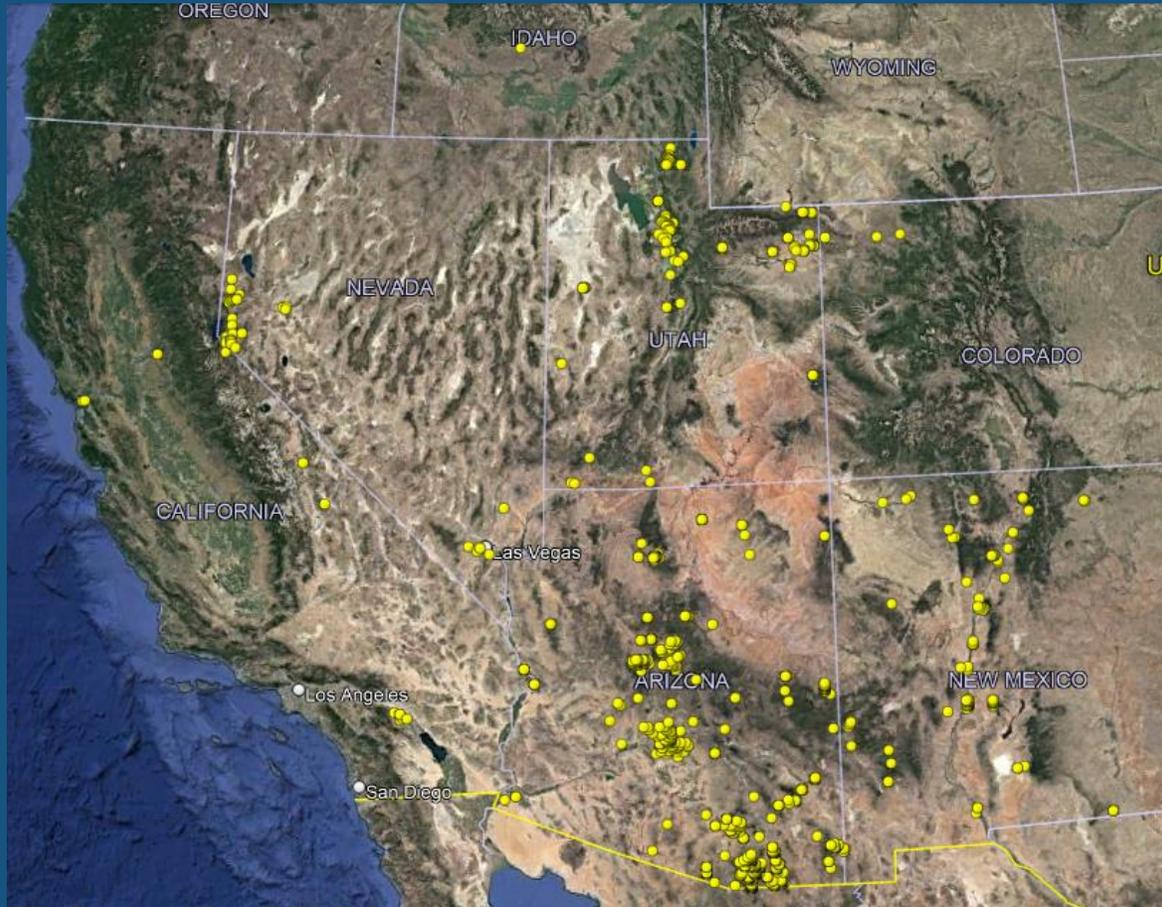


Arizona - Nevada - Utah - New Mexico - Western Colorado

Tagging locations and recoveries

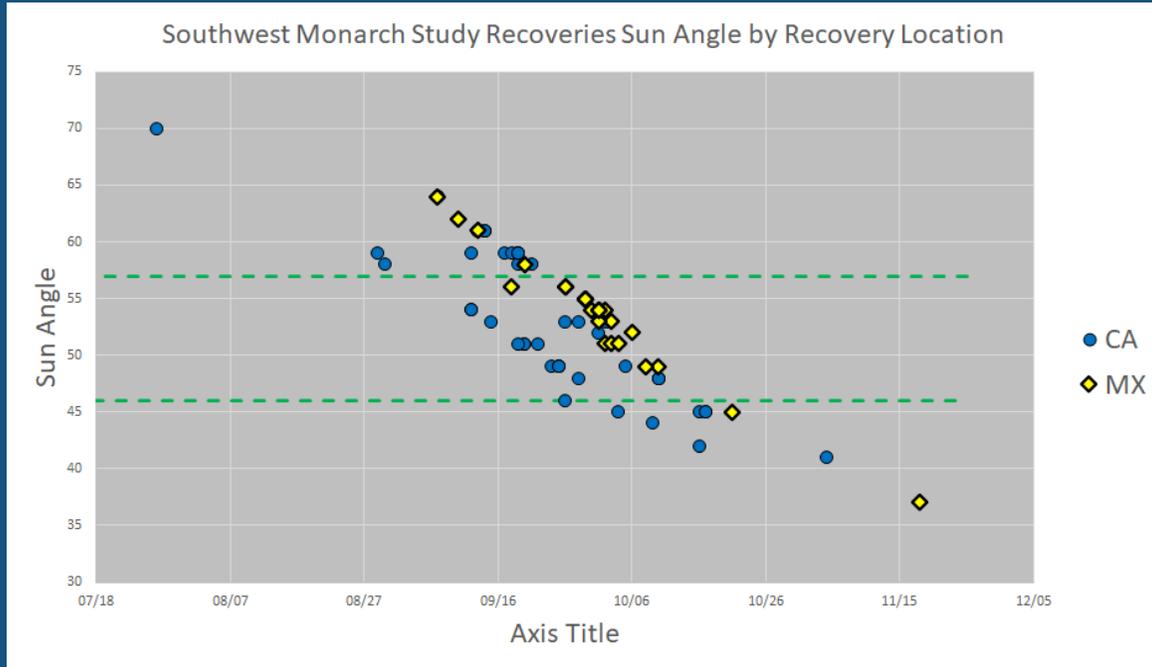
Monarchs tagged: 20,620

Monarchs recovered: 83

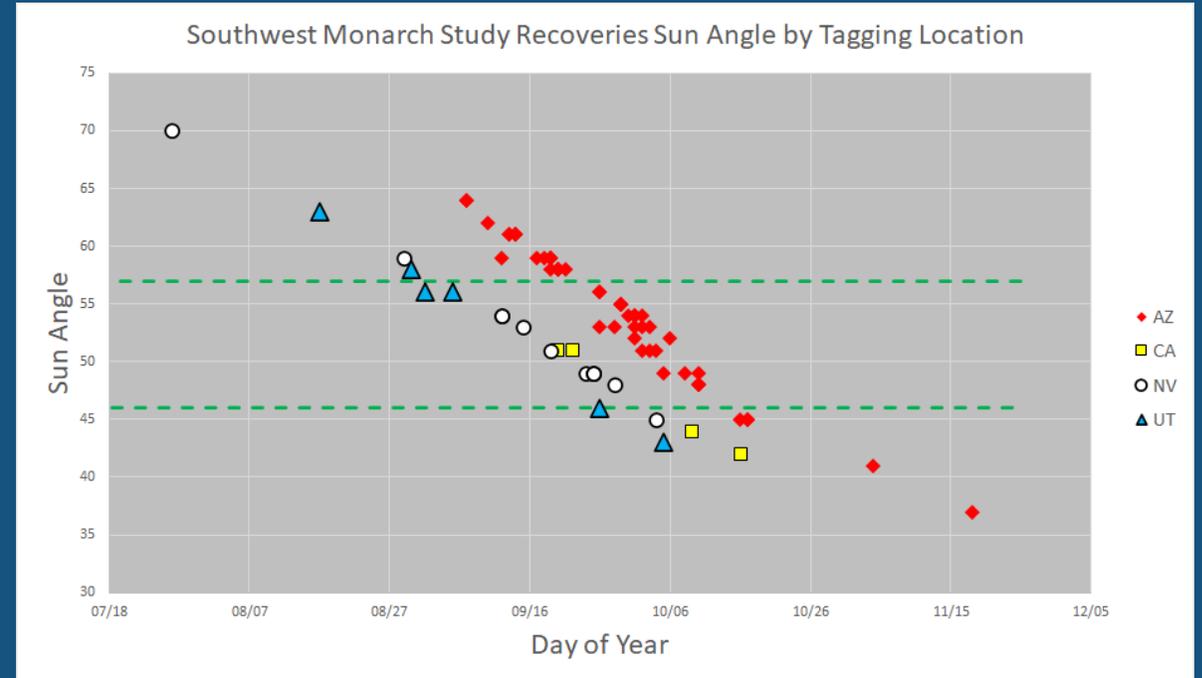


Recovery Sun Angle at time of Tagging

Recovery by sun angle California or Mexico destination



Recovery by state by sun angle



Taylor Jr, O.R., Lovett, J.P., Gibo, D.L., Weiser, E.L., Thogmartin, W.E., Semmens, D.J., Diffendorfer, J.E., Pleasants, J.M., Pecoraro, S.D. and Grundel, R., 2019. Is the timing, pace, and success of the monarch migration associated with sun angle?. *Frontiers in Ecology and Evolution*, 7, p.442.

Sun Angle and Recovery Rates

2003 -2021 Recoveries over 50 miles (Condition 3&4 Only)

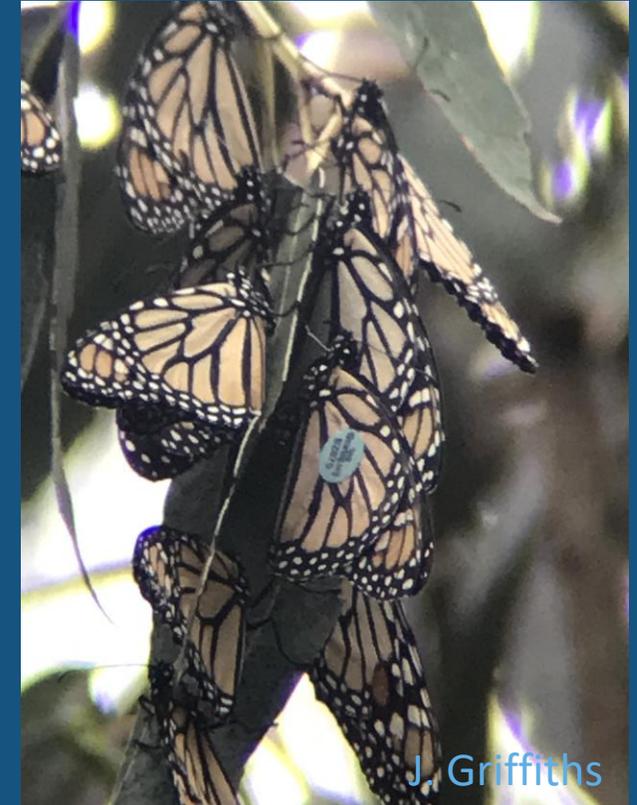
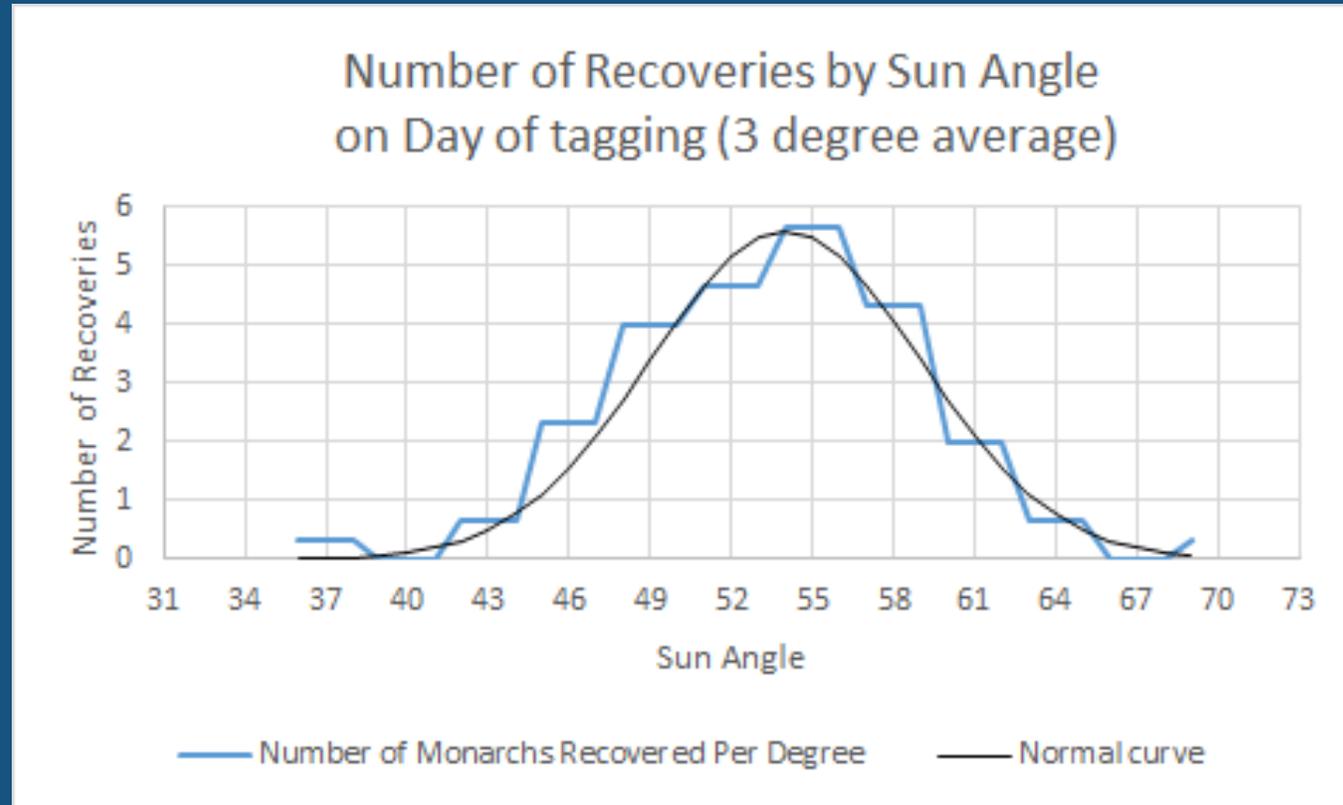
| Category | Sun Angle | All Tags | All Tags | Recoveries | Recoveries | Rate |
|-----------|-----------|----------|----------|------------|------------|-------|
| Early | > 57° | 5,613 | 37.0% | 9 | 12.0% | 1:574 |
| Main | 57°-46° | 5,441 | 39.0% | 45 | 60.0% | 1:121 |
| Post Main | <46° | 3,358 | 24.1% | 21 | 28.0% | 1:160 |

2003-2021 Recoveries over 50 miles: Wild, Reared, Farm

| Total | 13,962 | 75 | 1:186 | |
|--------|--------|----|-------|-------|
| Wild | 10,682 | 47 | 1:227 | 21.5% |
| Reared | 1,803 | 24 | 1:75 | 65.2% |
| Farm | 1,477 | 4 | 1:369 | 13.3% |



Recoveries by Sun Angle – to date SWMS has 78 recoveries



Tagging during the migration window improves the chance of sightings

Winter breeding and non-breeding monarchs in the lower deserts of Arizona & California

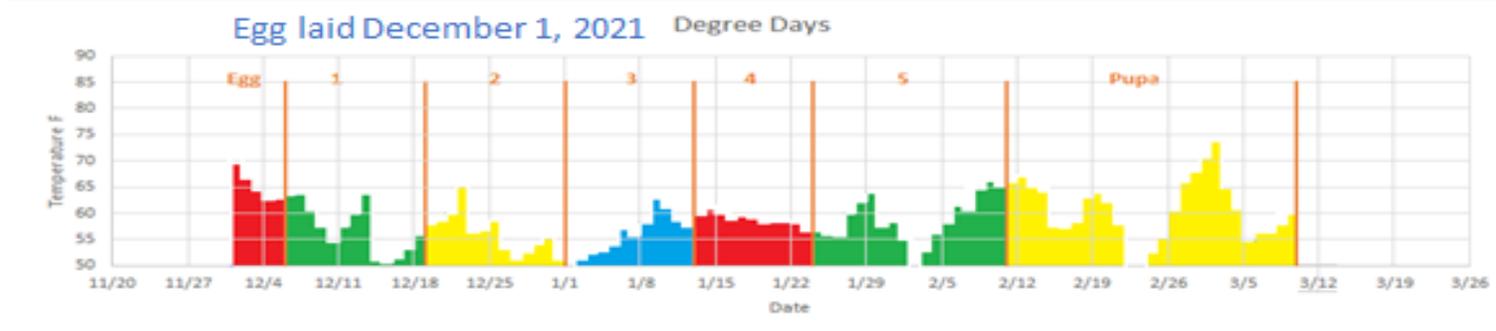
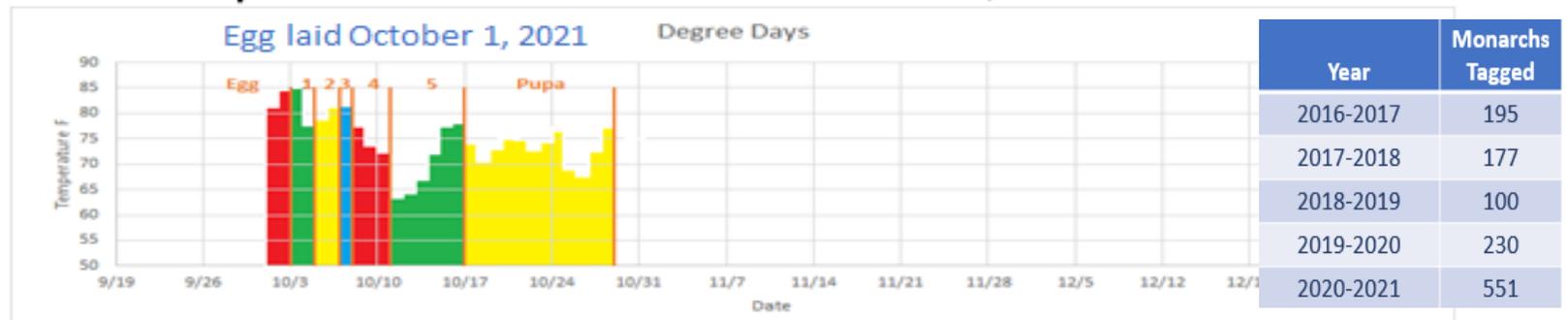


Tohono Chul, Tucson
February 23 2019
Post snow/freeze



Tohono Chul, Tucson
January 16 2019
Tagged October 6 2018

Fall & Winter Breeding Monarchs: Temperatures in Phoenix, Arizona 2021



Zalucki, Myron P. "Temperature and rate of development in *Danaus plexippus* L. and *D. chrysippus* L. (Lepidoptera: Nymphalidae)." *Australian Journal of Entomology* 21.4 (1982): 241-246.

CALIFORNIA

Finalizing with CDFW a 3 year SWMS permit with two tiers:

Tier One: Tagging only

Tier Two: MLMP/IMMP Activity 3,
Testing for Oe, tagging and release



Southwest Monarch Study

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and Conservation since 2003



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