

LOOKING BACKWARD: Dec. 31—Jan. 1, 2016

Was this the fifth year of drought? Here are my numbers of site visits:

Site:	2013	2014	2015	2016
Suisun Marsh	31	32	32	31
Gates Canyon	32	30	33	31
West Sacramento	34	33	35	33
North Sacramento	32	33	33	33
Rancho Cordova	31	33	31	34
Washington	21	21	21	21
Lang Crossing	18	18	18	17
Donner Pass	18	21	22	15
Castle Peak	7	9	7	5
Sierra Valley	18	20	20	19
Totals:	233	250	252	239

Sierran sites dried up and the season ended preternaturally early.

We'll look at MIGRATORS and LOW-ELEVATION SITES first.

Riparian vegetation fared well again and only showed marked water stress late in the season when Oregon Ash, Poison Oak, Elderberry, Snowberry and (to a lesser extent) Wild rose showed damage.

There were no significant arson or other fires in my Sacramento-area (or other) sites in 2016. The authorities ran goats in North Sacramento in midsummer, which reduced the potential fuel mass while having surprisingly little impact on the butterflies. The goats also led to the exodus of homeless from the area, many of whom either did not return or did so only very late in the season. Blue Oak did not drop leaves early. As in 2015, Euthamia, Aster, Ammi and Helianthus were all below par; many plants did not bloom or bloomed hardly at all; Ammi bloomed but mostly in dwarfed condition. Hemizonia, Heliotropium, and Trichostema had a good year, as did Eriogonum nudum and wrightii at Rancho Cordova. Heavy "pineapple express" rains in late autumn led to flood-control releases from area reservoirs, resulting in flooding of the gravel bars in Rancho Cordova and the Yolo Bypass in mid-December. Alamo Creek at Gates Canyon was dry much of the second half of the season, but the vegetation remained in decent shape and Blue Oak did not drop leaves early.

The CA Tortoiseshell, *Nymphalis californica*, returned from limbo. Hibernators were first recorded at Gates Canyon on ii.8 and though not numerous, persisted through ii.25. Most interestingly, they bred on "Jim Bush" in the canyon for the first time

since before the drought. Fresh individuals were first seen on iv.29 and again on v.13. None were seen at Gates in autumn. Hibernators were present at Washington ii.13-iii.18 and fresh ones v.11-v.24 with several presumed migrants viii.1. At Lang, hibernators iv.17-v.29, then nothing. Hibernators were present at Donner iv.17-vi.19 with a token presence on ix.10 and ix.16, presumably dispersing downslope. At Castle Peak no hibernators were observed but fresh animals were present on vii.22 and viii.6 and a few probable dispersers on ix.7. An unambiguous migration was observed at Sierra Valley on vii.12—about 150 fresh ones going NE>SW in a very narrow, well-defined band. On vii.22 a similar group was observed at Sonora Pass. On vii.26 a large movement was observed N>S at Lake Tahoe and on viii.1 an even larger movement >S over Mount Lassen. If they were at or near ground level at Donner and Castle, I never saw them (Donner vii.12, vii.30, viii.10; Castle vii.7, vii.22, viii.6). At any rate, the beast is back! No reports of where in the high country the S-bound ones estivated, but singletons as usual began showing up near sea level in fall (SM xi.9, xi.16; Rancho Cordova x.18; North Sac x.10). Earlier records were Rancho, v.14, Suisun vi.1; North Sac v.19 - these were the new brood dispersing upslope and eastward; compare Gates dates! Here are day-positives for the Sierran sites:

Year	LC	DP	WA	SV	CP	Total
2012	3	3	4	1	4	15
2013	2	4	9	0	5	20
2014	3	3	8	0	5	19
2015	4	3	8	0	1	16
2016	3	7	7	3	3	23

It was a very poor year for the Painted Lady, *Vanessa cardui*. The first immigrants were noted: Rancho Cordova, ii.23; Suisun, ii.4; West Sac, iii.23 (!); North Sac, ii.9; Gates, iii.17 (!). The two very late dates presumably just reflect the impact of scarcity on probability of detection. Numbers of late winter immigrants were minuscule and never really picked up. The southward movement in fall was barely detectable even in the Sierra, where rabbitbrush bloomed out early. Here are the numbers counted in the first and second halves of the season at low elevation:

Site	2012<viii.1,>viii.1	2013 (same)	2014 (same)	2015 (same)	2016 (same)
RC	37, 10	25, 45	106, 4	269, 1	25, 6
GC	15, 19	9, 35	121, 4	236, 2	22, 3
WS	44, 18	27, 37	116, 7	360, 3	22, 11
NS	55, 22	32, 38	140, 2	431, 3	31, 6
SM	35, 42	20, 77	159, 16	388, 12	32, 17
Totals	186, 111	113, 232	642, 33	1664, 21	132, 43

Numbers were poor in the mountains as well. At Washington a singleton was recorded on iv.6 and another on v.11 – period. At Lang, one on iv.6 and one vi.24. At Donner, two on vi.4, two vi.19, one ix.10, two ix.16, and one on x.8. Castle: one vii.7 and one ix.7, for a season total in the Sierra of 14 animals! This may be an all-time low.

Things were much rosier for the Buckeye, *Junonia coenia*, which seemingly overwintered at mid-elevation on the Sierran west slope. It was present at Washington from iv.30-ix.10; Lang, v.17-ix.16; Donner, vi.4-viii.25; Castle Peak vii.7 only; Sierra Valley vii.12-ix.8. Here are individual counts at low elevation:

Site	2012	2013	2014	2015	2016
RC	93	143	173	350	249
GC	69	63	196	269	254
WS	74	188	247	634	876
NS	153	395	483	1274	776
SM	101	95	132	391	244
Totals	490	884	1231	3818	2399

Once again, the usual seasonal Buckeye pattern was reversed: greatest abundance in the first half of the season, dropping off at the time when it usually maxes out in September!

The Fiery Skipper, *Hylephila phyleus*, had been expected to decline because its larvae are the preferred prey of the European Paper Wasp, *Polistes dominula*. But it didn't do so when the wasp was abundant. In 2016 the wasp population crashed, remaining below detectable levels until near the end of the season—but the skipper population *did* decline, presumably for other reasons.

Site	2012	2013	2014	2015	2016
RC	202	273	196	171	144
GC	26	34	22	69	30
WS	325	229	185	328	339
NS	351	444	325	454	308
SM	400	392	628	534	438
Totals	1304	1472	1356	1556	1259

Now for the species seemingly in peril of local extinction:

It was a better year for *Satyrium* at low elevations.

S. sylvinus: WS 2012:0 2013: 7 2014: 0 2015: 4 2016: 4

NS 2012: 20 2013:22 2014:44 2015:10 2016:83

GC 2012: 8 2013: 5 2014: 4 2015: 10 2016: 2

S. californica: GC 2012: 13 2013: 16 2014: 40 2015: 61 2016: 102

RC 2012: 2 2013: 6 2014: 4 2015: 4 2016: 34

S. tetra: GC 2012: 2 2013: 1 2014: 0 2015: 3 2016: 1

S. auretteorum: GC 2012: 3 2013: 9 2014: 17 2015: 7 2016: 25

S. saepium: GC 2012: 3 2013: 3 2014: 2 2015: 3 2016: 6

All *Satyrium* had probably their worst year of record in the Sierra. At Washington, one *sylvinus* vi.24 and no others. At Lang, one each *auretteorum*, *sylvinus* and *californica* vii.8, and one *saepium* vii.30. Donner: several *sylvinus* vii.30 and viii.10 and no others! Only one *fuliginosum* at Castle, vii.2; none seen at Donner; at Sierra Valley one *fuliginosum* vi.19, several *behrii* and one each *californica* and *tetra* vi.30, several each *behrii*, *sylvinus* and *californica* vii.12, still several *behrii* and one *saepium* vii.30.

Great Copper, *Lycaena xanthoides*:

NS 2012: 5 2013: 12 2014: 31 2015: 22 2016: 12

WS 2012: 2 2013: 1 2014: 1 2015: 0 2016: 0

SM 2012: 4 2013: 4 2014: 1 2015: 2 2016: 0 (extinct?)

The Yuma Skipper, *Ochlodes yuma*, rose from 4 at Suisun last year to 13 this year.

The Silvery Blue, *Glaucopsyche lygdamus*, had a very good year in the Valley:

NS 2012:0 2013: 12 2014: 3 2015: 8 2016: 49

RC 2012: 15 2013: 4 2014: 6 2015: 125 2016: 137

Pyrgus scriptura had a very strong year at SM and WS but may be extinct as a breeder in NS:

NS 2012: 0 2013: 1 2014: 0 2015: 1 2016: 1

WS 2012: 38 2013: 29 2014: 35 2015: 55 2016: 189 (best in many years)

SM 2012: 2 2013: 3 2014: 8 2015: 13 2016: 41 (again, best in a long time)

And *Pholisora catullus* deteriorated in WS and was not seen in NS, though a city resident across the river from my site (Dick Wood) reports it continues to breed in gardens and vacant lots there:

WS 2012: 37 2013: 23 2014: 17 2015: 71 2016: 29

NS 2012: 4 2013: 5 2014: 0 2015: 1 2016: 0

But two individuals were seen at SM (iv.5, iv.13) and one in Davis (viii.11), in both cases the first in over a decade; but no breeding seems to have ensued. (Also, there was a female *Phyciodes campestris* in West Sacramento on x.12—the first of that species there since two in 2002!)

Speaking of dark skippers, *Erynnis tristis* has nothing to be mournful about:

RC	2012: 10	2013: 24	2014: 25	2015: 32	2016: 37
SM	2012: 1	2013: 9	2014: 20	2015: 50	2016: 42
WS	2012: 9	2013: 42	2014: 31	2015: 76	2016: 126
NS	2012: 59	2013: 42	2014: 31	2015: 88	2016: 125
GC	2012: 27	2013: 31	2014: 12	2015: 66	2016: 62
Totals	106	148	119	312	392

Ochlodes sylvanoides and *Poanes melane* famously returned to the Valley a few years ago. How are they doing?

<i>O. sylvanoides</i>	2012	2013	2014	2015	2016
GC	161	229	81	99	108
WS	18	13	4	1	1
NS	59	69	20	20	25
RC	89	83	191	116	173
SM	40	11	50	30	34
Totals	367	405	346	266	341

P. melane

GC	85	79	47	54	52
WS	20	7	1	3	7
NS	20	29	16	13	14
RC	2	4	4	5	6
SM	3	6	1	5	3
Totals	130	125	69	80	82

Lorquin's Admiral, *Limenitis lorquini*, had its best year yet!

RC	2012: 8	2013: 34	2014: 14	2015: 29	2016: 36
GC	2012: 38	2013: 67	2014: 38	2015: 47	2016: 69
WS	2012: 37	2013: 61	2014: 21	2015: 31	2016: 54

NS	2012: 6	2013: 11	2014: 29	2015: 26	2016: 23
Totals	90	173	102	133	182

The Variable Checkerspot, *Euphydryas chalcedona*, continues to wobble near extinction at Gates, with 7 seen in 2014, 14 in 2015, and 7 again in 2016.

The Mourning Cloak, *Nymphalis antiopa*, went down sharply in 2015 and stayed down in 2016:

RC	2012: 22	2013: 4	2014: 12	2015: 6	2016: 3
SM	2012: 2	2013: 1	2014: 1	2015: 0	2016: 0
WS	2012: 5	2013: 10	2014: 12	2015: 2	2016: 1
NS	2012: 15	2013: 10	2014: 3	2014: 4	2016: 1
GC	2012: 49	2013: 40	2014: 27	2015: 20	2016: 32
Totals	99	68	55	32	37

The Pygmy Blue, *Brephidium exile*, had a terrible year everywhere. At its metropolis, Suisun, it peaked early, on ix.28, at only 622 individuals.

The Western Tiger Swallowtail, *Papilio rutulus*, famously recolonized Davis after a decade of absence and has now been regionally strong for five years:

SM	2012: 12	2013: 21	2014: 22	2015: 19	2016: 28
GC	2012: 40	2013: 90	2014: 47	2015: 94	2016: 71
WS	2012: 44	2013: 63	2014: 27	2015: 47	2016: 75
NS	2012: 28	2013: 25	2014: 31	2015: 38	2016: 54
RC	2012: 42	2013: 57	2014: 46	2015: 40	2016: 75
Totals	166	256	173	238	303

The Pale Swallowtail, *Papilio eurymedon*, was up at GC:

2012: 70	2013: 53	2014: 8	2015: 32	2016: 51
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The Anise Swallowtail, *Papilio zelicaon*, had a good year at some but not other sites:

RC	2012: 5	2013: 4	2014: 2	2015: 2	2016: 3
SM	2012: 58	2013: 13	2014: 27	2015: 16	2016: 50
WS	2012: 3	2013: 4	2014: 1	2015: 3	2016: 2
NS	2012: 20	2013: 31	2014: 18	2015: 36	2016: 44
GC	2012: 8	2013: 3	2014: 1	2015: 2	2016: 5
Totals	94	55	49	59	104

And finally, the Gulf Fritillary, *Agraulis vanillae*, survived a severe freeze (21-22F) and bounced back:

RC	2012: 5	2013: 18	2014: 38	2015: 12	2016: 15
WS	2012: 0	2013: 4	2014: 12	2015: 18	2016: 16
NS	2012: 11	2013: 16	2014: 31	2015: 38	2016: 24
SM	2012: 0	2013: 12	2014: 18	2015: 47	2016: 47
Totals	16	50	99	115	102

It was a very poor year for subtropical strays, with one *Phoebis sennae* at Suisun, vi.12, and one *Leptotes marina*, also at Suisun, vii.27. Lots of *Heliopetes ericetorum*, though: SM iv.25, NS iv.28, GC ix.1 and RC ix.20, plus a sighting of many at McLaughlin Reserve ix.16 (Eric LoPresti), apparently breeding.

GENERAL OBSERVATIONS—LOW ELEVATION

The drought years (2012-16) have been remarkable for the restoration of the seasonal patterns of the 1970s in the Valley—nearly constant and high numbers of species and individuals flying virtually the entire season. Here are the 2016 seasonal species maxima by site, with dates: SM 24, ix.3; GC 29, v.13 (28 on v.31); WS 22 on v.4 and ix.5; NS 24 on vi.6; RC 21 on vi.7. None was near record territory, though, unlike last year. Last year's seasonal maxima, for comparison, were: SM 20 (ix.18 and x.3); GC 30, v.1; WS 26 on ix.25; NS 27 on v.26; RC 17 on iii.25, x.7 and x.16.

Willow Slough (vii.4, as always) had 23 species and 913 individuals, compared to 20 and 1624 in 2015, 19 and only 317 in 2014, and 22 and 918 in 2013. After very poor performance in 2013-2014, *Pieris rapae* had shot up to 1094 individuals last year, or 2/3 of the total for all species. This year it fell back to only 335, while *Colias eurytheme* remained stable around 300. A reminder that the high species numbers during the drought years have been a dramatic reversal of a long-term, essentially monotonic, decline in species richness, as demonstrated in our paper with Mike Rosenzweig (O'Brien et al., *Biol. Cons.*, 2011).

While we're thinking about *Colias eurytheme*, we should note that there was a massive outbreak of this species in the Valley in mid-July, the first since x.2012. They clogged car radiators and urban gardens alike. Later there were several localized outbreaks, apparently not synchronized. One more seeming return to the pattern of the "good old days!"

Phenologically, there were lots of early and especially late bugs, but very few records: *Lycaena helloides* in RC on iii.1, *Erynnis tristis* in NS on iii.2, *Ochlodes sylvanoides* at SM on vii.19, and *Papilio rutulus* in Davis on xi.15. *Phyciodes mylitta* on ii.1 just missed the GC record by one day. *Danaus plexippus* somehow reached SV on iv.3!

GENERAL OBSERVATIONS—SIERRA NEVADA

It was a *terrible* year in the Sierra, marked by low numbers of both species and individuals everywhere, with many things either not seen at all or in drastically-reduced numbers. Melt-out was not very early so there were few early-season surprises except the Monarch at SV in early April. At Washington the number of species peaked at 25 on v.11 (in 2015 it peaked at 24 on v.2) and was down to 8 on viii.12 (6 on viii.6.15). At Lang it peaked at 26 on vi.24 (vs. 28 on vii.1.15) and was down to 5 on viii.27 (vs.10 on viii.19.15). At Donner, the peak was 41 on vi.30, vs. 37 on vi.18.15); at Sierra Valley the peak was 26 on vii.12, vs. 21 on vi.28.15. But in both years the end of the season dragged on (7 species on x.21.16, 5 on x.10.15). Castle Peak was unspeakable, peaking at 34 on vii.7 and dropping to 8 on ix.7. In 2015 the peak was 37 on vi.25 and there were 4 on ix.19. Rabbitbrush bloomed 2-6 weeks early and was done at Donner by mid-September. Enough persisted in bloom at SV to allow the latest species to persist, too. The general drying of the herbaceous vegetation at Donner was similar to 1992. In both years there was essentially zero summer rain—the monsoon fizzled. The list of things that were either not seen or were extremely rare is very long. *Mitoura "siva"* was almost absent at SV. Ditto *Plebeius shasta* and *Satyrium fuliginosum* on Castle Peak, and *Pyrgus ruralis* and the usual summer *Hesperia* entity at Lang. All the species of *Speyeria* remained rare, as in 2015, with *S. callippe* the worst-off. *Polygonia zephyrus* was very rare, and again totally missing at rabbitbrush in autumn. Two big winners that don't normally overwinter were the Buckeye, *Junonia coenia*, whose dates were already given, and the Acmon Blue, *Plebejus acmon*, which was flying at Donner on vi.30—last year it was out on iv.17! but I think, given the later meltout this year, that it may have overwintered again.

The most striking thing about these drought years is the difference between the Valley, where everything seems hunky-dory, and the Sierra, where the butterfly fauna is in free fall. And we can't blame that free fall on habitat change, or pesticides. It HAS to be climate- (or at least weather-) driven.

Monitoring is an open-ended soap opera. As of December 23 the northern Sierran snowpack is only about 2/3 of the 30-year mean, though total precip is between 150-210% of mean (the snow line has run very high most of this precip season). Our data, properly coddled and massaged, should have many stories to tell us. At least some of them should give us glimpses into the future.