

NABA Butterfly Count Column

Pacific Monarch Abundance

by Ann Swengel

The graph on page 33 presents several ways of plotting Monarch abundance on counts in the Pacific coast states through 2007. What can count data teach us about Monarchs, and how they're doing?

Only counts ever reporting a Monarch are analyzed, as including all counts would dilute patterns. Monarch abundance is expressed as individual Monarchs observed per party-hour per count. (A party-hour is an hour spent observing by counters working together as a party, or group.) This makes results comparable among counts. Only counts held within a four-week span are included, because Monarch abundance can vary among months within the growing season.

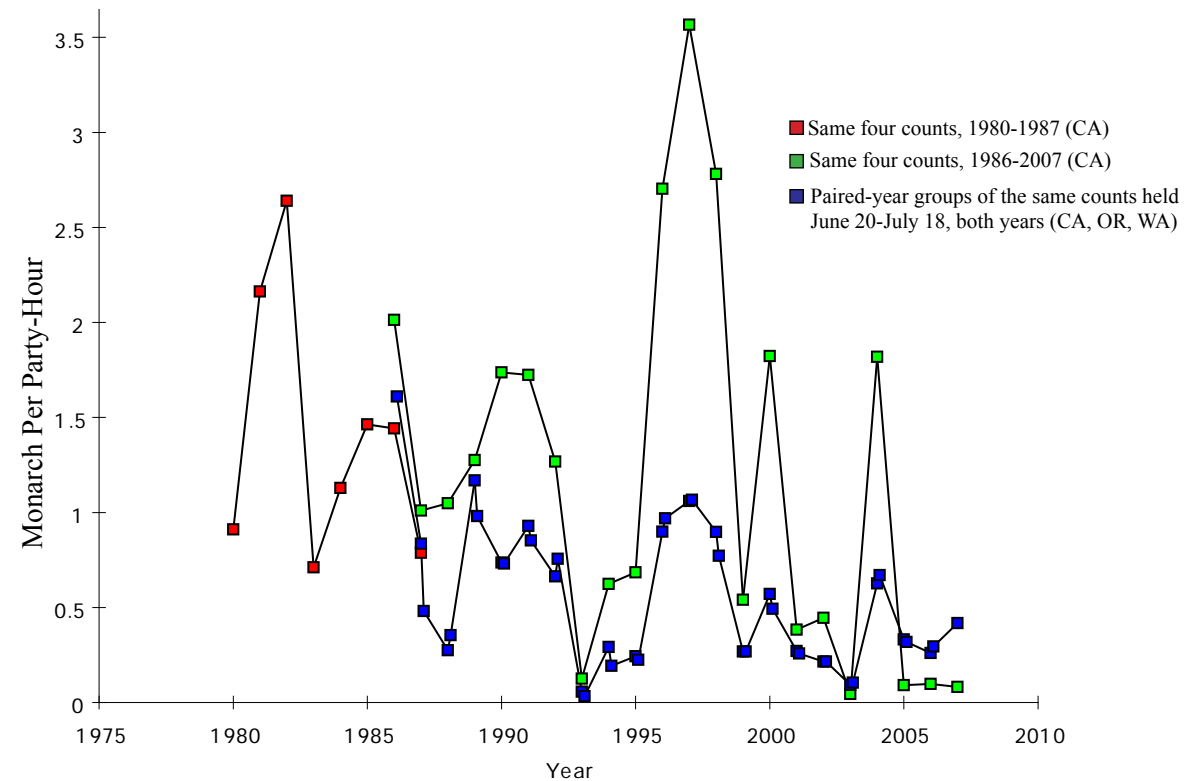
The different plots in this graph represent different tradeoffs between including more counts (since local conditions on one count may not reflect general patterns in the region) and more variable control (e.g., analyzing only the same counts each year since Monarch abundance varies among count circles because of habitat differences). By keeping count circles the same each year, only four (all in California) are available for 1986-2007, but count dates are under the four-week spread both within and among counts, from 8 June to 4 July. To project back earlier, again only four circles are available (again, all in California, and three are the same as in the other group of four) for 1980-87, with count dates under the four-week spread within count but from 19 June to 28 July for all counts pooled.

The sample of counts is larger, and comes from all three coastal states, for paired-year analysis, which only keeps counts the same within a consecutive pair of years. The pairs overlap (e.g., the 1986-87 pair overlaps with 34 *American Butterflies*, Spring 2008

the 1987-88 pair, etc.). So, except for the very first and last year, there are two plots for each year in this analysis, and those two plots have somewhat different samples of counts. Except for only five counts in the first pair (1986-87) and a record 20 counts in the 2005-06 pair, 8-17 counts occur in each pair. The time period (June 20-July 18) was selected to maximize number of counts in the earlier years (see also count column in Summer 1999). This "paired-year" analysis is best suited to determining whether Monarch abundance went up or down since the previous year.

Each line has many ups and downs, plus the lines vary somewhat as to whether Monarchs go up or down and by how much in certain years (e.g., 1989-1991). But the two lines that overlap in enough years to support statistical analysis — the same four counts and the paired-year counts for 1986-2007 — correlate very strongly and positively with each other. So these two different approaches generally agree on the up and down years.

A point that count data make well is that butterfly numbers vary a great deal from year to year. These natural ups and downs relate to factors such as climatic variation. The fewer counts in a calculation, the more these numbers swing up and down: compare the four counts 1986-2007 to the paired counts, which always had more than four counts. The four can swing as low as the paired-counts can (see 2003 and 2005-07), but the four can swing much higher (e.g., 1997). So these fluctuations may get evened out by pooling counts — a bad year in one circle may be counterbalanced at least somewhat by another location perhaps faring better than average.



What about long-term trends? Despite the ups and downs, in both the same-count and paired-count approaches, the direction of the trend is, unfortunately, negative (downward) and in the last few years, this decline became statistically significant (non-random). Just a few high enough years in the next few years could reverse this decline. But if the next five years continue like the last five, that decline would strengthen even more.

Is this a decline related to a string of years with unfavorable weather, that might turn around if the weather swings back in a different direction? Or is this a persistent problem related to habitat loss or unfavorability? That's harder to answer.

Migratory Monarchs are a conservation concern because of their need for specific vegetative and climatic conditions in their wintering sites, plus suitable habitat where they migrate to for breeding. On the other hand, Monarchs are among the most mobile butterfly species, so they might re-occupy degraded or destroyed habitat if it becomes suitable again.

Many other butterflies of conservation concern have the same issues with good and bad years. But they must survive those bad years viably in the same place where the population lives year-round. Since such butterfly species do not migrate, the habitat where a given population occurs must always have suitable conditions for their survival. Otherwise, the population may die out, and if no other population lives nearby, there may be little hope for "rescue" of this site by recolonization from elsewhere, even if the site becomes suitable habitat again.

How will things turn out for Pacific coast Monarchs? Keep counting and we'll find out!

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Price for the 2007 report (in stock) is \$10 (NABA members) or \$15 (non-members).
Price for the 2008 report, if ordered by March 1, 2009 is \$7 (NABA members) or \$11 (non-members); after March 1, price becomes \$11 (members) or \$16 (non-members). Send your check or money order payable to NABA (in U.S. dollars) to: NABA Butterfly Count, 4 Delaware Road, Morristown, NJ 07960 USA. For more information, visit www.naba.org.