

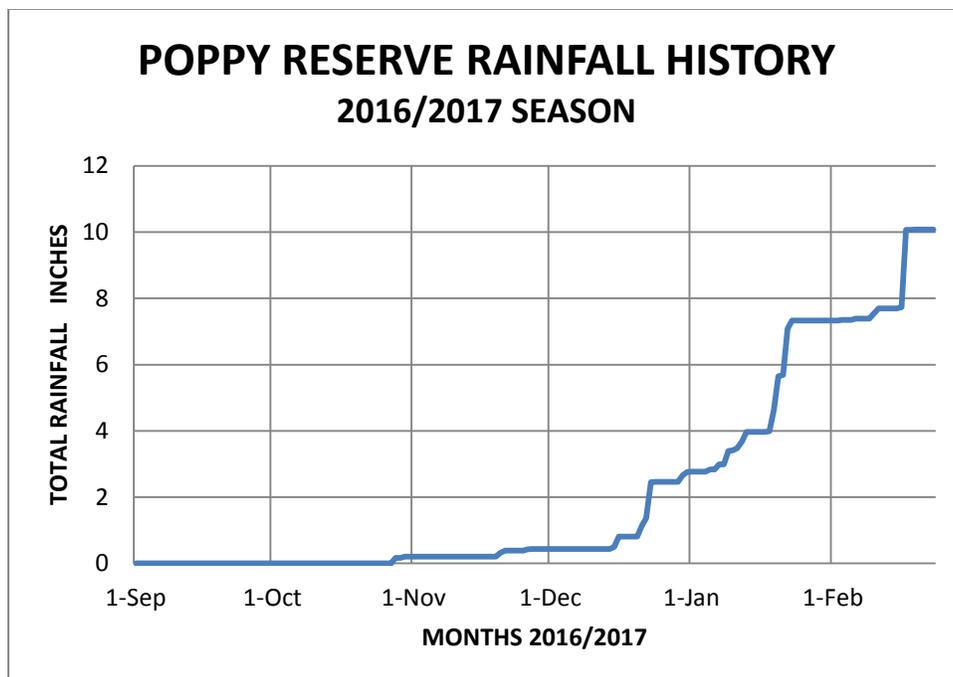
## REPORT FROM THE FIELD

March, 2017

By  
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Each spring edition I “walk the plank” with my annual prediction on the quality of the upcoming spring wildflower season. Contrary to published reports with predictions that this spring’s wildflower displays could be outstanding, I sadly expect the Poppy Reserve’s poppy displays will be only modest to moderate/good this year with the best displays along the Antelope Loop trails. My prediction is based on field observations and plant inventorying at the Reserve. The published reports that I have seen are predictions for other prime Southern California wildflower areas, Anza Borrego and Death Valley, and not specifically for the Poppy Reserve. Based on the rainfall it has received this winter, even Saddleback State Park, as well as the LA County wild preserves on the east side of the Antelope Valley, could have excellent wildflower displays this spring. Each published prediction contains caveats because what happens between the time of the prediction and the actual spring wildflower season is still obviously unknown. This is true for my prediction as well. Being late February at the time of writing this posting, it is very unlikely to have a deep cold snap that would kill the currently growing young poppy plants so the only significant threat to my prediction is unseasonably warm temperatures in March that would dry the soil and stunt the growth of, or kill, the young plants. This has happened in a few past years so this remains a real potential possibility. Because seed germination didn’t occur until mid-December this winter, the plants are smaller and less mature than in many years when seed germination occur in October or November. The plants’ less developed root systems make the plants particularly susceptible to drying soil damage. Although the wildflower displays are starting late this year, because this winter’s total rainfall already exceeds the researcher’s complete tracking season’s, Sept through May, total rainfall average for the last nineteen years, I expect this spring’s wildflower displays to last beyond the Mother’s Day weekend closing of the Reserve’s Visitor Center.

With predictions for outstanding wildflower displays at other locations, what happened at the Reserve this winter that results in my prediction for the Reserve’s poorer poppy displays this spring? I believe the answer is in this winter’s rainfall pattern. A plot of the Reserve’s rainfall is shown below:



Although there were several minor rainstorms in October and November, the plot shows that the rainy season didn't really start until mid-December and it has been quite rainy from then on. The plot also shows that this winter's total rainfall has come from numerous relatively weak storms and two or three very strong storms. Based on our years of field observations, the researchers have found very limited amount of poppy seed germination following rainstorms depositing less than at least 0.5-0.6 inches of rain. With more rainfall, increasing numbers of poppy seeds germinate until somewhere between one and two inches of rain results in the maximum number of seed germination. Increasing rainfalls above that optimum amount results in less and less germination of poppy seeds. Based on these observations, we would expect little or no seed germination following the October and November storms and reduced seed germination from the limited number of strong storms. In essence, the storms this winter have been either too weak or too strong to result in the large number of seed germination required for the best poppy displays. Because the seeds of each plant species requires different soil conditions for germination, even though we don't see large amounts of poppy seed germination on the Reserve doesn't mean that large numbers of other wildflower seeds haven't germinated. This is one possible reason why predictions are calling for outstanding displays at other locations; they have different mixtures of wildflower species.

There could be another factor that has influenced the quantity of poppy seed germination this winter. This winter's rainstorms have been unique in that they have almost all come from atmospheric rivers, moisture laden currents of air carrying massive amounts of water flowing from the south central Pacific Ocean northeastward before making land on the west coast of the US. In contrast, our more typical winter storms are cold northern storms originating in the Gulf of Alaska; moving south. For the typical northern storm, the period of heavier rain lasts only 6 to 8 hours, or less, whereas the rainy period for atmospheric river storms lasts for many hours, even several days. The limited soil moisture data that has been recorded on the Reserve show that the soil is quite porous. During the short duration northern storms, the soil moisture near the soil surface increases during the storm but peaks as soon as the storm ends and quite quickly dries out. Within a day, or two, the soil moisture level has returned almost to the pre-storm level. With the seeds in the soil's seed bank concentrated close to the soil surface, the majority of seeds are exposed to maximum soil moisture for a relatively short time. With the longer duration atmospheric river storms, the seeds are exposed to the high soil moisture for a much longer period of time and that could affect their propensity to germinate.

Because field observations have found little seed germination following late winter storms, even storms with optimum rainfall, it seems unlikely that any significant additional seed germination will occur this year. We likely have to be satisfied with the poppy plants that are currently growing. That's not to say that any additional rain is not important. Total seasonal rainfall is also important because that sets the moisture reservoir that the plants draw on to keep growing and surviving into late spring/early summer.

Visitors don't come to see poppy plants, per say; they come to see the intense orange poppy color. The quality of poppy displays is much more complex than simply the number of growing poppy plants. There are a number of other factors that influence the poppy color. Generalized poppy color is really a subjective state because it is when the eye/brain transitions from seeing individual poppy blossoms to simply seeing a solid swath of orange color. I suspect there is a critical poppy blossom areal percentage where this transition occurs but confirming this is an area for future research. The number of poppy plants obviously impacts the transition to seeing generalized color. Actually, the plant density, the number of plants per unit area, is probably the important factor but, the more plants growing, the closer they have to be to each other. Plant size is likely also an important factor because larger plants have more open blossoms at any time. During drought years, the smaller observed poppy plants typically have only one to three open blossoms; infrequently, maybe up to eight or ten on select plants sited in preferred locations. In contrast, even very late in the spring 2003 wildflower season, a spring with outstanding poppy displays, the larger poppy plants still had up to 20 open blossoms at any time. It is a lot easier to see 20 closely clustered blossoms as a solid color than simply two or three blossoms. The blossom's petal size is probably another important factor in the transition. Field observations have shown that poppies have a

few select petal lengths and, although these preferred petal lengths do not change throughout the season, the frequency of the petal lengths does shift to the smaller preferred sizes as the season progresses. This shift to shorter petal lengths might be due to the maturing of the plant but it could also be due to the drying of the soil throughout the spring. During drought years, which naturally have drier soil conditions, the smaller poppy plants also have blossoms with shorter petal lengths. Finally, it should be noted that even a small decrease in petal length causes a large change in the blossom's cross-sectional area and, hence, the blossom's areal percentage.

One last thought on poppy color. The peak in poppy color occurs at the balance point between the formation of new blossom buds and the loss of the petals on mature blossoms as they transition to the fruit stage. The shift to smaller petals and the loss of the blossom's color intensity due to the shift to bi-color petals (increasing portions of petal's outer edge becomes the paler yellow as the season progresses) could have secondary effects on when the peak poppy color occurs.

Because the seeds of every plant species require different conditions for their germination to be triggered, each year's spring wildflower displays are different, unique. Although I don't believe that this year's poppy displays will be historic doesn't mean that this year couldn't be quite special. Most springs the beautiful, tall stemmed, purple blossomed wild hyacinth, or blue dicks, can be found scattered across the Reserve but mostly only single plants; in a few cases, two or three plants might be clustered near each other. Based on this winter's field observations, this spring's displays of wild hyacinth should be outstanding, amazing. This year might even become known as "the year of the wild hyacinth". Instead of seeing single, or two or three, wild hyacinth's tall monocot, this winter numerous, dense clusters of a dozen and more monocots have been observed. The volunteer researchers were repeatedly awed by what we found. As spectacularly beautiful as the wild hyacinth's blossom is, it is still not the carpet of radiant orange of the poppies that the visitors come to the Reserve to see. Because the goldfield's small cotyledons are typically so densely packed, it is hard to compare this year's growth but, I believe, this could also be an outstanding spring for goldfield displays. Now that the slender keel fruit plants are a little larger and starting to bloom, we are seeing very large amount of this species as well. Several seasons ago, there were areas so dense with slender keel fruit plants that they created patches of generalized color similar to poppies and goldfields; the slopes were solid bright yellow. Based on limited observations, this season could be as good as, if not better, than that season.

It's really amazing, when you think about it. How can a plant species that normally grows only in limited numbers scattered across the Reserve suddenly have an explosion of abundance, like the wild hyacinth is doing this year? Where did the seeds needed for this expansive display even come from? Reading a little about the wild hyacinth, I learned a few things about this species that I didn't know; even that it has an extra trick up its sleeve. Before sharing what I learned about the wild hyacinth, I want to share some thoughts on what it takes for any plant species to grow on the Reserve. Every plant species growing on the Reserve needs, at least periodically, the proper conditions to trigger germination of its seeds and the germination periodicity must occur more frequently than the length of time its seeds maintain viability while in the soil's seed bank. There is an extreme range in how long the seeds of different plant species can lay dormant but still viable (still able to germination when the right conditions occur) in the seed bank. At one extreme, it has been reported that 90% of tumbleweed seeds lose their viability in one year and all the seeds will lose their viability within two or three years. At the other extreme, a 2000 year old middle-eastern palm seed has been successfully germinated, grown and pollinated a female palm tree to produce dates but the palm seed is a mere youngster compared to the extinct Siberian wildflower seeds, cached in the permafrost for 32,000 years, that have been germinated successfully by Russian scientists.

An internet search found little information on seed viability for the primary plant species known to grow on the Reserve with limited exceptions; primarily the invasive annual grasses Red Brome and Cheatgrass and tumbleweed, already discussed above. Because these two invasive annual grasses are pervasive across wide areas of the western US, extensive research has been conducted on them to better

manage their invasions. A USDA document reports that 98% of Red Brome seeds lose viability within one year and an University of Nevada, Las Vegas master's thesis reports similar results; 93% of the buried seeds lost viability after one year and 98% after 18 months. Published papers on cheatgrass report similar, but slightly longer seed viability life spans; a majority of seeds lose their viability within one year but buried seeds can stay dormant for two to five years. To maintain their local plant populations, plant species with short seed viability life spans must be able to germinate under very wide conditions. Being able to germinate under very dry soil conditions protects these short life span species from extreme, multi-year droughts. The large number of seeds these grasses produce quickly replenish the soil's seed bank following a year of little germination. Unfortunately, I was unable to find any published data on the Reserve's native plant species so we are left with only anecdotal observations. Because goldfields grow nicely on both the drier east side of the Antelope Valley and the wetter west side, it is possible that the goldfields have short seed viability life spans. On the other hand, with periods of 20 or more years between outstanding displays of owl's clover, its seeds must have a much longer viability life span. The only data I have on poppies are some personal germination experiments. Some limited germination tests using five or six year old poppy seeds resulted in no germination but it is possible that the test's moisture conditions were simply inadequate to trigger seed germination.

Finally, back to the wild hyacinth. From my reading, I discovered that the wild hyacinth is a perennial monocot and, interestingly, a cormous plant. Although there are several other divisions of flowering plants, Angiosperms, flowering plants are primarily made up of monocot and dicot (more properly called Eudicots) divisions of plants. Grasses are probably the best known examples of monocot plants. The Joshua tree is also a monocot species. Because the vast majority of flowering plants are dicots, most of the plant species on the Reserve are dicot species. The terms monocotyledons, or monocots, and dicotyledons, dicots, refer to the first plant structures that emerge from the soil after seed germination occurs. Initially, immediately after seed germination, root structures begin to grow and only then followed by the cotyledon emergence. Cotyledons are also called seed leaves because they are part of the seed. In contrast, the plant's "true leaves" are formed only after seed germination by the meristem, located primarily at the growing tip of roots and stems, where all cell division occurs to form all the different structures of the plant. Monocot plants have a single cotyledon cell within the seed's embryo whereas dicot plant species have two cotyledon cells. Each of the poppy plant cotyledon splits again so its cotyledons are a pair of forked structures an inch or so long. This secondary forking helps identify poppy plants from the other newly emerged plant species. The wild hyacinth has a surprisingly large monocot; a foot to two feet long and 1/16 to 1/8 inch in diameter. The cotyledons of some plant species draw on the energy of sunlight through photosynthesis to create the chemicals needed by the plant to make new plant material while the cotyledons of other species have no photosynthetic ability and draw on the endosperm portion of the seed for their needed growth energy. Besides the difference in the number of cotyledons, buried deep within the seed, there are other more easily identifiable plant structural differences that can generally be used to differentiate between monocot and dicot species. Dicot species typically have taproots with secondary root hairs where monocots form networks of equal sized roots. The leaves of monocot species generally have only parallel veins while dicot species have smaller, secondary veins branching off of the main veins. Finally, monocot species generally have hollow stems and dicots have solid stems.

As mentioned, wild hyacinth is a cormous plant. Corms are swollen enlargements located at the buried end of the stem. There is a difference between corms and bulbs. Corms are solid, made up mostly of starches, while true bulbs are layered. I think of onions as an example of a bulb. Being a perennial plant, new stems can grow each season from the corm that has survived the off-season period. Published sources report that a corm can stay dormant for twelve years or more waiting for the right soil conditions to trigger new stem growth. Underground cormlets will also form at the tip of root-like growths from the corm. New plant stems can also then grow from each cormlet. New plants can also grow from germinating dispersed seeds. It generally takes two or three years for a plant growing from a germinated seed before the plant will blossom. Unfortunately, I was unable to find any data on the wild hyacinth seed vitality but, with new plants growing from both corms and germinated seeds, the wild hyacinth has an extra

mechanism to help maintain its local population. Although it doesn't answer directly how the wild hyacinth can suddenly have an explosion in population abundance one season, this dual mechanism certainly gives some insight.

With spring just around the corner, we can only wait to see what the poppy displays are eventually like this season but, however the poppy displays are, we will likely be rewarded with some very special displays of the Reserve's other wildflower species.

#### PLANT SPECIES KNOWN TO BE BLOOMING ON THE POPPY RESERVE AS OF 2 MARCH '17:

California poppy – Actually, I'm stretching the truth here. This first blossom of the season was actually found along Lancaster Road; a mile or two from the Reserve. On the other hand, numerous buds, at various stages of development including extended stems, were easily found on the Reserve itself so it is expected that open poppy blossoms will be found on the Reserve within the next few days; before I have the next opportunity to visit the Reserve. This blossom has probably been open for a day or two. If you look closely at the picture, it can be seen that the blossom is part way through its maturing cycle. The anthers, the blossom's male organs, are mature and starting to split to disperse pollen but the four stigmas, the blossom's female organs, have not yet started to grow. Botanists claim some plant species use this blossom sequential development technique to reduce the possibility of self-pollination.



1. Goldfields – So far, only a couple open blossoms seen.
2. Filaree – Surprisingly few because these blossoms are normally one of the very first to open.
3. Slender keel fruit – Several years ago, there was an amazing display of this species blossoms even forming generalized carpet displays of bright yellow color analogous to poppies and goldfields. Based on the large number of plants being seen this year, there could be carpets of color again this year.
4. Red maids – Scattered with a few small clusters of multiple blossoms. Expect many more of these deep red blossoms soon.
5. Fiddlenecks – Scattered with most blossoms just starting to open. There are a large number of plants of this species this year. Expect an explosion of these yellow blossoms soon.
6. Forget-me-nots – Both the very small, belly flower version and the full size version are now blooming and will only get better displays soon
7. Loco weed – only a few plants are currently blooming.
8. Desert parsley - There could be a good crop this spring.
9. Wild cucumber - Beautiful white star blossoms are on these large vine plants.
10. Wild hyacinth – The first blossom of what should be many has already been found.

